Data for paper
published Jan. 1942
Carnegie Inst. Wash. Pub 530
pp 187–203

Humerus Taboun

More inflation of Bicipital area on ancoreal side. Notch at distal Contact with shaft.

2) Capital groove less deep

3) - Papilla of Supra spinatus - isolated ± transverse.

Whole bone more slender.

170.5
.65
852 5
10230
11082 5

170.5 = .65
X = 100.

170.5
153
5115
8525
17105
26086 5

4 = .25
x = 100

~~15~~
~~10 = 66~~

153
65 | 100.00.
65
350
325
250

Drawn by Lois Miller

Tarsi in V.C. cold. Others there
3 meas. on other side of this card.

4 yg. prox. 1 rt. 30920A
1 left 30920
1 rt 2050, 6-C-10
1 rt. no data

1 yg. with no dist end - no data

6 rt yg. dist # 30920

2 left yg. dist 30920A ~~not~~ loc 1054
~~12535 on 1~~

1 left ad. dist $\frac{1054}{12535}$

4 rt " " 30920 (on 3
12531 (on 1) loc 1054

---

complete rt 2050, 6-D-71 # 30928
labelled fabian mysteries
309.8 length broken & mended
might affect length (would be longer)
br. prox art. 23.0, least br hyp 10.4; sq. 12.3
calc. ridge low this can't be measured
Length lig. facet 6.8, Br. 5.4, 5.8 x 7.4 br. to length tib
br. dist. 11.2, br. to mid 11.1 br dist 11.0

---

1 comp. rt tibia, 1 dist. left tibia, MCK Jr.
1 femur, 1 ant. chuck. but too dist. to meas.

---

1 ad Rad prox. frag ~~calcified~~ fabian mag
chan on C. mastigan - prox & dist ends
complete, curved

10 dist Rds (2 ad) 2 prox Uln (3 d is turkey)
req meas. stained on other card

U.C. Stanford

2050 – 9-F-13'3" Parsons st. with hypostaum br. bear

length 273.5'; br. prox. art. 23.5; br. tub. 6.3; length tub. 7.4; br. dist. 10.5'; br. mid sh. 10.0, length lig. facet 7.6; br. canine 5.3.

Type length 260.3 mm? 257. front tip & tip not straightening bend

prox. art. 20.1 – length br. hypo 10.5'; length mid. calcaneal 15.3, br. dist. 23.3, 10.0 br. dist.

5.4 x 7.0 = br. & length of tuberosity (internal styla) Loc 1059 # 11202

U.C. B.G. vol. 5 x 30 p. 440 fig. 1, 1910, Miller

Rt. yg. warped 2051, 13-6-5' length 275.5' mm, br. prox. art. X; br. dist. 24.7

br. hypo-facet 11; gr. 12.5'; 5.3 x 7.2 br. & length tub. 10 br. dist.

Palaeociconia australis Moreno 1889

Sieze = do. American maguari stork
(between left Spatula cyanea & L. jamaicensis)

Material = Two dorsometatarsi

Placetage = Cave deposit at Lagoa Santa, Brazil
Pleistocene.

References: 1889 Moreno – Bol. Mus. La Plata. S. 30
1891 Ameghino – Enumeración de las Aves fósiles de la República Argentina. Rev. Argentina Hist. Nat., 1, S. 445.
1891 Lydekker. Cat. Fos. Birds Brit. Mus. S. 64-65 pg. 15.

Propelargus cayluxensis Lydekker 1891 – Quercy low. Oligo

" edwardsi Lydekker, 1891, Allier Miocene

Palaeopelargus nobilis Del. 1892 – Queensland Pleist.

Palaeociconia australis Moreno 1889 (nec Ameghino) – Pleist. Brazil, Argentina

Pelargodes magna (Milne-Edwards) 1868 – up. Oligo. Allier &c.

" stehlini (Gaillard) 1908 Quercy low. Oligo.

" Tronessarti (Gaillard) 1908 " " "

Amplipelargus major Lydekker 1891 low. Plio. Samos

Ciconia gaudryi Lambrecht 1933 p. 323, Pliocene Pikermi up. Mio. Steinheim

Pseudotantalus Milne-edwardsi (Shufeldt) 1916

Tantalus bressicensis Marmora – Pleist. Sardinia

Xenorhynchus ramus De Vis 1888 - Australia Gent.
Xenorhynchopsis tibialis De Vis 1906 - Plesio Australia
" minor De Vis 1906 " Aust.
Palaeophiporhynchus dietrichi Lambrecht 1930
Lower Oligo. North Africa

Leptoptilus falconeri Milne Edwards 1868
Lower Plio - Siwalik India
" arvernensis M-E. 1871. up. Oligo of Langy.

Storks - present distribution

India, Ceylon, Assam, Burma, Siam, Cochin China
Malay Penn, Indo China, Sunda Is, Celebes & Philippines - Sumatra, Java
East Africa from Senegal & Sudan & Zambesi R.
Wn Africa from Angola & Ethiopia & Angola & Damaraap
Madagascar
Africa from Senegambia & Sudan So. & Cape Province
Borneo
Lower Ussuri & Amur Rivers & Korea & Japan
Europe & lat 60°, Morocco, Algeria, Tunis.
Bucharia, Turkestan, Yarkand

So. Sweden, Denmark, Germany east thru
Russia & Asia & no. China, entire Africa so of
Senegambia & Sudan
Africa from Senegal & Sudan so to Orange River
" " " " "

So. Amer. — Guianas, Chile, So. Argentina
So. Mex., Cent. Amer., so Amer & Argentina (NE Cordoba)

New Guinea, so. in Torres Strait, N & E Australia
Central & So. Arabia, Hainan, ~~Sumatra~~

Fossil storks

Ciconia maltha Miller

1910 U.C. Pub. Geol. vol. 5 – p. 440; 1925 Carnegie Inst. Wash. 349, 69, 74-75
1932. Condor 34 pp 212-216. fig. 23, 1931. U.C. Pub. Geol. 20 364, 366, 374
1925, U.C. Pub. Geol. 15, 317, 1938, Trans. San Diego Soc. N.H. 8, 455-462
Howard 1930 Condor 32, 81-88, 84 fig 31.

Jabiru mycteria

Miller 1922 Condor 24, p. 123; Wetmore 1931 Smiths. Misc. Coll. 85 # 2, 12-18
Wetmore 1928 Amer. Mus. Nov. # 301 pp 2-3.

J. wilsoni - Sellards 1916 Fla. State Geol. Surv. 8th Ann. Rept. p. 14. pl. 16, figs 1-4, text fig 15 & C.

over

Pseudotantalus milne-edwardsi Humfeldt 1896 - Proc. Acad. Nat. Sci. Phila 51.2 - 613/4-1

imp. mus. St. albans Europe ?

Seminole Field - W W Holmes

J. L. Daggett Farm 29 mi S. of St. Augustine C. B. Howard

Melbourne, Brevard Co. J. W. Sidley

Okeechobee River site - ~~E. H. Sellards~~ Fla. State Geol. Surv.

Vero, Stratum #2 E. H. Sellards

Grand Falls, Idaho

Fossil stork bones borrowed for study on American fossil storks

U.S.Nat. Mus.
11684 -- Distal end of Tibiotarsus, American Falls Idaho (from gravel pit with musk ox bones), July 20, 1929. Gidley, coll.

12102 -- Distal end of carpometacarpus, west side of golf links, Melbourne, Fla., lower no. 2 bed, 4/15/28. Gidley coll.

12098 -- Distal end of tarsometatarsus, west side of golf links, Melbourne Fla., 3/1/28. Gidley, coll.

12200 -- Thirteen bones; Seminole Field, Fla. Holmes, coll.
3 upper end of coracoid, 1 distal end ulna (crane?), 2 distal end of tibiotarsus, 3 distal end of carpometacarpus (one is crane?), 1 proximal end of carpometacarpus, 1 distal fragment of tarsometatarsus, 2 incomplete scapulae.

16471 -- Distal end of tibiotarsus, 29 mi. south of St. Augustine on J.L. Daggett farm, 6½ miles south of Marineland, Fla. EBHoward, col

American Mus. Nat. Hist.
6197 -- Two bones, Ciego Montero, Cuba, Pleistocene, 1918
Distal end of tibiotarsus, proximal end tarsometatarsus
(Measurements prox. art. surf. tarsus 24.2mm.br., 13.7 depth)

Fla. State Geol. Surv.
V2795 -- Carpometacarpus with proximal end broken
V2798 -- " nearly complete
V2800 -- Fragment of upper end of coracoid
V2801 -- Distal end of Ulna
} Vero, Florida Sellards collection

V4577 -- Carpometacarpus (complete)
V4724 -- Tarsometatarsus, proximal end
V4785 -- Coracoid (Trumpeter Swan)
} Itchtucknee River, Fla. coll'd later than the above group. Noted in Wetmore, Smith. Col. vol. 35, p.10, 1911.

Univ. Calif.
12532 -- Fragment of upper mandible, Rancho La Brea
Co-type of species Ciconia maltha

Presented by U.S.Nat. Mus.
Cast of Type of Jabiru weillsi Sellards -- Humerus

Calif. Inst. Tech.
Locality 138 -- Cranium with upper mandible (now separated) no. ~~1358~~ 1894
52 pieces tarsometarsus
32 " tibiotarsus
6 " humerus
Sternum
Fragment of rostrum
2 complete, 3 tips lower mandible
8 femors
5 coracoids, 1 carpometacarpus, 1 toe bone
22 fragments of tarsus or tibiotarsus

Ret'd 3/10/28

Sellards description 1916
8th Ann. Rept Fla. Geol Surv
p 146

"JABIRU? WEILLSI, SP. NOV.

Pl. 26, figs. 1-4; text-figure 15, p. 157

"The relationship of the large bird found in stratum No. 2 appears to be with the storks and the species is referred provisionally to the genus Jabiru/ When compared to the recent Jabiru mycteria (Mycteria americana) the bones of the wing, although approximately the same in circumference, are found to be longer and hence proportionately more slender than those of that species. The metacarpal bones of the fossil bird are flattened while those of the recent species are more nearly oval in cross section, in this respect approaching Ciconia rather than Jabiru. The corocoid is small as compared with the wing bones, and it is not impossible that more than one species is represented.

"Measurement of wing bone:

Length of humerus.	.280 mm.
Least circumference of humerus.	90
Length of ulna (estimated).	270
Least circumference of ulna.	38
Length of metacarpal bones	.150
Least circumference of the larger metacarpal. . .	29

The species is named for Mr. Isaac M. Weills, who has contributed so largely to the development of the vertebrate fauna found at Vero. The type specimen is a humerus. Fla. Surv. coll. 5961: Paratypes, right and left metacarpals, 6781 and 7022; and part of a corocoid 6782."

Taken from "Human Remains and Associated Fossils from the Pleistocene of Florida. Fla. State Geol. Surv. 8th Ann. Report, pp. 121-160 pl. 15-31, text figs. 1-15. This item on page 146.

Not quoted

Jabiru? weillsi and one other species of bird were obtained from stratum No. 2. Of Jabiru,"the humerus was found lying loose on the bank, while the other bones were taken in place from the north bank 370 feet west of the bridge. The bird bone illustrated to show engravings (fig. 3, pl. 22) was found at the same place in the bank and was very probably a piece from a wing bone of this species."

Legend for Plate 26 gives measurements and other info.

"Fig. 1. Humerus. Times.65. Actual length of bone 180 mm. From the north bank, thrown out by the dredge. Fla. Surv. coll. No. 5961. ..."

"Fig. 2: Corocoid. Found in place in stratum No. 2. Fla. Surv. coll. No. 6782. Approximately one-half natural size. Actual length of specimen 57 mm. Ths bone is shown natural size in text figure 15,p.157.

"Fig. 3. Metacarpals. Aproximately one-half natural size. Actual length of bone 150 mm. Fla. Surv. coll. No. 7022.

"Fig. 4: Ulna. Aproximately one-half natural size. Fla. Surv. coll. No. 6780.

"Fig. 5: Right humerus of small bird, slightly reduced. Actual length of bone 35 mme. Fla. Surv. coll. No. 6979. This bone was obtained from siftings from the sand in which the human bones were imbedded -----p.146.

"The bird represented by these bones, figs. 1-4, has a longer and more slender wing that that of the modern stork, Mycteria americana.

and Summary from p. 159 of article by Sellards
on Human remains/associated fossils from the Pleistocene of Florida.

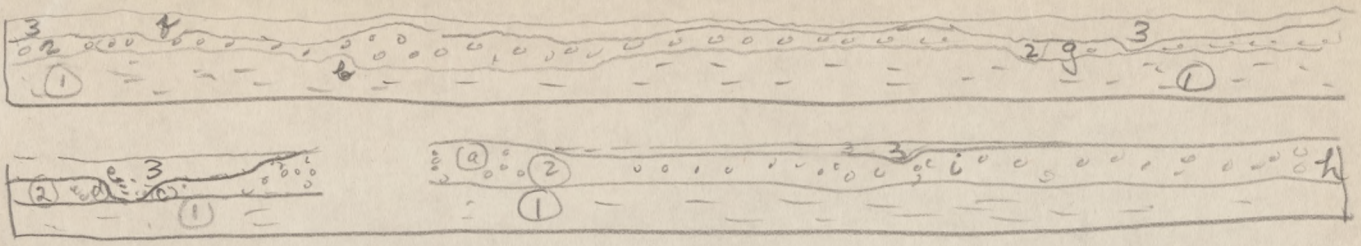
"In considering the fossil human remains from Florida interest centers chiefly in the horizon represented by stratum No. 2 of the section at Vero, this being the earliest stage in which human remains have been found. That this horizon is of Pleistocene age and that man was then present in Florida is determined by the observations recorded in this paper, of which the folloiwing paragraphs contain a summary.

"In October, 1915, skeletal remains of man were found in place in stratum No. 2 of the section in the canal bank at Vero at the locality indicated by a in text-figure 2; in April, 1916, a bird bone and the tip of a proboscidian tusk on which are found markings which apparently were made by a tool were taken in place in this stratum at the locality indicated by b; in June, 1916, skeletal remains of man and a spawl from a flint implement were taken in place in this stratum at the locality indicated by c, and while passing the sand from this stratum through a sieve several additional small flints and two bone implements were found at localities c and d. At locality a the stratum holding the human remains grades at the top into a hard marl rock. At localities b,c, and d the stratum holding the human remains is overlaid by an alluvial deposit, no. 3 of the section. This overlying deposit is stratified and was undisturbed above the human bones. These observations, as well as the mineralization and manner of occurrence of the bones, establish the fact that the human remains are fossils normal to the horizon and were not introduced into it by burial.

P. 160

"That this horizon holding the human remains is of Pleistocene age is shown by the fauna. The fossils found with or near the human remains in this horizon include such characteristic Pleistocene species as Megalonyx jeffersonii, Chlamytherium septentrionalis, Equus sp., Tapirus haysii?, Mammut americanum, and Elephas columbi. From this horizon as a whole has been obtained a large vertebrate fauna including many extinct sp

"With regard to culture, the men of the stage of the Pleistocene represented by stratum No. 2 of the section at Vero were then making flint implements, a fact fully extablished by the discovery in place in the Pleistocene bed of a spawl from such an implement, They apparently were also making bone implements, two of which have been obtained from screenings from the Pleistocene deposit. They probably had also acquired the art or custom of engraving on bone, this conclusion being supported by the discovery in place in the Pleistocene bed of a bone and of a proboscidian tusk having markings which seem ngly were made by tools. Further support of this fact is derived from the presence in the formation of small flints obtained from screenings which may have served as tools for this purpose."



p. 129

Fig. 2: Sketch showing the strata exposed in the canal bank at Vero. Horizontal scale 1 inch equals 73 feet; vertical scale 1 inch equals 25 ft. The section here represented is that of the north and south banks of the canal from the Florida East Coast Railroad bridge west a distance of 512 feet (See sketch map fig. 1). The break inthe sketch indicates the entrance of the lateral canal from the south. The base line is drawn at water level in the canal which at that time stood 18 feet below the top of the railroad track. The strata exposed are: (1) A marine shell marl found generally throughout this part of the State and cut into by the canal here as elsewhere; "9) a fresh-water sand, muck, and marl bed containing fresh-water invertebrates; plant and vertebrate fossils including human remains; (3) an alluvial bed consisting of incoherent sand, muck and vegetable material containing plant and animal fossils and human remains.

Human skeletal remains have been found in stratum No.2 at a and at c Markings on a bone and on a proboscidian tusk were found in this stratu at b. Flints and bone implements were found in this stratum at c and d Hu an skeletal remains, pottery and implements were found in stratum No 3 at 3 and f.

Skull and Mandibles

Cranium.-- Seven from Rancho La Brea, one from McKittrick.

The species exhibits a marked supraorbital flare in the fossil crania flares out and is
The supraorbital region in the fossil resembles that of the recent is distinct from the brain case; antieriorly the frontal is depressed between the slightly uplifted supraorbitals; posteriorly the skull narrows in markedly in the region of the parietal fossae; supraoccipital region narrow

Upper Mandible

Since the description of the narial fragment of the upper mandible, as co-type of the species Ciconia maltha (1910) there is now fairly available a complete specimen of this element and two portions of the tip from the McKittrick deposits (have been added) The nea ly complete mandible, Calif. Inst. Tech. no. 1894 is restored in three pieces, two of which have a clear point of contact. The contact for the tip is admittedly questionable, However by a study of the other available tip fragments and the general slope of the upper part of the beak it is certain that the present restoration represents essentially the correct shape and size of the element, which in no wise resembles the deep upward curving beak of Jabiru. Any such relationship is further denied by the lower mandible, two fairly complete specimens of which are now available, as well as several fragments All mandibular material is of the slender type with nearly straight rami, characteristic of Ciconia and Euxenura as distinguished from Jabiru.

The fragment of mandible described as the co-type of C. maltha; In describing the mandibular fragment as co-type of C. maltha, the following characters were enumerated (Miller, 1910): "The cross-section in the nareal region is almost an equilateral triangle The nostrils are slit-like with edges overhanding above and rounded below; the proximal and distal extremities are smoothly rounded; there is no internareal septum. The buccal surface of the beak is closed over entirely and marked to a point slightly beyond the nares by a double groove down the median line, and from this point on by a shwllow median depression." After a study of the material now available, the following points of comparison with C.ciconia Euxenura and Jabiru may be added:

(1) Although the proportions of height to breadth in the fossil are closer to Euxenura and Jabiru than to Ciconia, it is evident, that relative to length the beak of fossil is both narrower & lower than any of the living forms with which it is compared; Jabiru is ~~both broader and higher than that of the fossil or either of the smaller living forms~~;(2)

Malthagoras agrees with Cicoria
in the following respects

Cranium —

position of protuberance on basitemporal plate
(two lateral & anterior, & all prominent)

Lower mandible

Symphysis 30 - 33% of length — (less than Eux. or Jabirus)

Scapula

Material available. — Thirteen from Rancho La Brea; 2 from Florida (probably both from one individual)

Description. — Only two out of ten specimens show narrowest across head ~~shoulder~~ than minimum for Sabina, Conyza with reversal of figures for breadth of shaft (C. S. out of ten ~~head~~ head narrowest) indicative relative proximity in fossil

Description. — Closely approximating Sabina in size (breadth of head averages 34.9 mm in Malthus 26.1 mm in Sabina). Cuxenura & Ciconia smaller and not overlapping.

Space between acromion & articular head broad & shallow, ~~concave~~ rounded; ~~dorsal~~ ~~surface at~~ a narrower deeper notch in Sabina & Conyza rounded ~~as in Sagittarius~~ forming a bone ~~roofed~~ a small projection on inferior side at this point. Cic. & Cux. similar to fossil.

Distinct depression at base of articular head on outer side usually perforated with ~~several~~ pneumatic foramina. Two near ~~small~~ depression surrounding one at the latter. Similar in Sabina. Cuxenura lacking ~~this~~ depression, Ciconia with slight tendency & depression & small foramina

Scapula - Stork

Space bet. acromion & coracoid of articular head broader & shallower in fossil - a narrow sharp notch in Jabiru

Acromion appears narrower in fossil

Skull – Rec. Stock

	br post to foramen a	br across proc. b	br ant. to proc. c	Depth thru center d	Br sup. oc. e	Ht sup. oc. f	fe	ab	cb	da	eb	Br upp. cand. at cand. naris	depth at same place	length of nares	jx	Ht upp. cand.	Q length bas. ant. naris to hyp	xQ	yQ	length post condyle to max Y
Cic 203	31.7	47.1	25.7	34.3	37.7	26.6	70.6	67.3	54.6	108.0	80.0	20.8	15.4	17.7	74.1			14.0 / 14.5	10.4 / 10.9	148
1331	32.7	49.1	30.7	35.0	37.9	26.2	69.2	66.6	62.5	107.0	77.3	22.5	17.0	16.9	75.6		137.5	16.3	12.3	153
Cuv 242	34.8	49.3	26.7	38.7	39.1	29.0	74.3	70.6		111.2	78.4	20.5	20.0	17.1	97.4		162	11.3 / 12.6	11.1 / 12.3	180
204	37.5	51.3	32.6	41.2	40.3	31.0	77.0	73.0		109.5	78.3	21.6	20.8	20.9	96.3					
19940	34.7	48.4	28.7	38.8	38.4	30.0	78.3	71.7		111.8	81.3									
Fabien 34346	46.3	59.2	44.5	43.5	53.0	35.9	67.7	78.3		94.2	89.4	37.8	33.3		88.2					240?
34346	45.5	60.8	42.3	44.2	54.1	37.7	69.3	74.7		97.0	88.8	38.0	33.0	26.?	86.8			14.4	12.5	263
34346 2					59.5							41.4	38.7		93.4		258	14.4 / 16.0	13.4 / 14.4	287
McK unid. 12532												23.0 / 27.5 / 28.5	22.5 / 23.8 / 23.4	22.3 / 23.5 / 23.7	97.7 / 86.5 / 82.8	218 estimate 210	222	9.4 / 10.3	9.2 / 10.0	243
C7369	37.3	56.8	—	—	44.4	31.4	70.0	65.6			79.4									
F395	38.0	—	34.7	34.2	45.6	32.8	72.0	—		103.1										
F430	38.0?	54.9	35.2?	39.0	41.8	30.2	72.2	63.3		112.0	76.3									
F340	40.3	59.5?	39.0?	40.6?				67.7		100.9										
F366	38.7	58.8	39.3	39.7	45.5	33.5	73.4	65.7		102.5	77.3									
V12705	31.3	—	41.7?	40.6	44.5	31.3	70.4	—		108.9										

	a length mandible (corr)	b length symphysis	c depth ant. to anomal. curve on corpus	ba	ca	x length to culmen	depth symph. at ant. edge of ext nares	depth at ant. edge of nares	yx	zx	n. length ext nares	nx	yz	length w/ studied bone ⅔ ext nares	ratio depth to	ratio ba to
343461	330.2	109.7	30.7	48.4	9.2	297.0	33.1	37.6	11.1	12.6			88.0			
343462	363.6	175.7	34.6	48.4	9.5 (88-96% culmen)	321.7	38.4	41.1	11.9				93.5			
343463	320.1	150.0	29.7	46.7	9.2 (long jaw)	284.2	33.3	36.9					90.0			
343464	332.6	163.0	31.4	49.0	9.4	293.6	34.7	39.0					89.1			
343465	315.1	147.4	28.2	46.8	8.9	281.2	33.2	35.5					93.5			
343466	341.6	156.5	32.1	45.8	9.4	306	33.5	40.0					83.7			
343467	328.0	160.0	30.7	48.7	9.3	290.2	33.8	37.0					91.4			
	7) 2331.2					7) 2074.5										
	333.0					296.3										
									8.0	8.4						
	319 –	110 –		34.5	7.2				7.4	8.4						
NeKi.	323.5	114.5 –	23.2	35.7	7.1											
									7.9	8.2						
	348.5	106.0	23.7	32.1	6.7			284	7.8	8.1						
	2) 672.5								7.6	8.1						
	336.2					290	22.3	23.6	7.5	8.0	dp 22.0	7.5	93.7	242.	9.6	9.8
v.c cotype						295	23.0	26.8					86.0			
cc 1504	207.1	56.4	14.8	27.2	7.1 (82-83% culmen long jaw)	170.0	17.7	21.1	9.2	12.4	dp 16.5	9.7	74.5	148.7	10.5	14.2
1334	216.0	66.5	16.1	30.8	7.4 (long jaw)	180.0	17.1	21.9	9.5	12.1	17.0 dp	9.4	78.3	155	11.0	14.1
	2) 423.1					2) 350.0										
	211.5					175.0										
cuttama 247	248.0	92.6	18.0	37.4	7.2 (85-90% culmen long jaw)	211.8	19.8	19.8	9.3	11.4	17.2 dp	8.1	100.0	180.	11.0	11.0
204	256.6	108.1	20.0	37.9	6.9 (long jaw)	244.7	20.7	21.4	8.4	8.7	dp 21.0	8.6	96.8	214.2	9.6	9.8
49040	2) 504.6					2) 456.5										
	262.?					228.2										
49041	238.?					224.?										
	4) 1034.6					202.3										
	258.6					4) 854.5										
						220.4										

295.?
284
2) 579
289

579
267.7
3) 1846.7
282.2

267.7
288.5
2) 556.2
278.1

Cranium — Fossil †Recent Stork Skulls

√ = % which differ from fossil

	gr br cranium a	br at parietal foramen b	least br ant. c	ht cran. d	gr br oc. e	ht oc. to top of occiput f	ht oc. from underside cond. g	br oc. inside measr. h	ht oc. inside foramen i	ba	da	ha	ih	db	fe	ea	length cond. to nasal x	length symph. y	gr depth 3	ratio y/x
K2705	—	36.7	—	40.2	44.7	31.2	28.4	43.2	24.0	—	—	—	55.6	109.2	69.7	— (mille 75.3)	350.8	106.5 (105.5)	25.2	30.0
F 366 √	58.8	38.4	39.3	39.7 √	45.8	33.3	30.8	44.6	25.4	65.3	67.5	75.7	58.0	103.3	72.5	78.0	mck 340 (321 ap.)	~~103.5~~ 108.5	23.7	~~30.7~~ 33.8
F 430	54.9	35.0	—	38.4	41.8	30.3	28.3	40.4	23.3	63.7	70.0	73.6	57.7	109.6	72.4	76.3				
F 340	—	40.0	—	41.0	—	—	29.8	—	24.7	—	—	—	—	102.3	—	—				
F 395	—	38.0	—	39.4	45.5	32.5	30.5	43.8	25.6	—	—	—	58.2	103.7	71.5	—	mck tip only	94.1		
C7369	56.7	37.0	—	—	44.4	31.0	28.8	43.4	24.1	65.3	—	76.5	—	—	69.8	77.3	mck tip	103.		
F1057	—	36.8	31.6	39.3	—	29.6	27.2	—	22.8	—	—	—	—	106.8	—	—				
McKitt	55.5	35.6	40.3	39.8	42.7	31.3	28.6	41.2	23.9	64.2	71.7	74.1	58.3	111.8	73.3	77.0				
Coi															from Miller	75.3				
Bi 1334	49.1	32.7	30.7	34.6	37.8	26.1	24.2	36.7	20.7	66.7	70.5	74.7	56.4	115.9	69.1	77.0	216	67.0	16.8	31.0
203	47.1	31.6	25.7	34.3	36.8	25.7	23.8	35.8	20.8	67.2	72.9	76.0	58.2	108.5	69.8	78.3	216	65.5	16.0	30.3
1504	47.0			35.8													207	55.3	15.5	26.7
Emy 19940	(48.4)	34.8	28.5	39.3	38.3	29.5	28.2	32.7	24.1	71.8	81.1 √	77.9	64.0 √	42.9	77.0 (Miller 79.1)	79.2			14.5	
242	49.3	34.9	26.7	38.6	39.0	28.9	27.7	38.8	23.4	70.8	78.4	76.8	62.0	113.3	74.2	79.3	247.8	92.8	19.5	37.6
204	51.3	37.6	32.6	41.2	40.6	31.1	29.2	39.7	24.6	73.4	80.3	77.4	62.0	109.2	76.6	79.2	287.0	109.0	21.3	38.0
343464	60.4	46.2	47.0	45.8	54.1	36.3	33.2	53.0	27.6			88.2 √						158.2		
Jaf 343462	56.0	51.3	47.7	49.2	59.7	40.5	36.2	58.2	30.5	77.7	94.4		52.4	95.7	67.8	90.6 √	332.5	169.2	32.1	50.8
343461	60.7	45.4	47.1	44.7	54.0	37.1	33.5	52.9	28.3	74.7	93.6	87.0	53.5	98.5	68.1	88.9	330.0	155.+	31.0	46.7
343465	59.2	46.2	44.4	43.5	53.0	36.5	34.0	50.7	28.3	78.5	93.4	85.8	55.7	94.3	68.8	89.6	315.0	147.0	30.0	46.6
343466	62.2	48.6	41.9	40.5	56.5	39.0	34.5	55.5	30.0	78.3	94.8	89.3	54.1	95.7	69.0	91.0	341.6	152.5	32.8	44.7
343467	61.3	44.1	45.5	45.7	52.8	36.3	32.7	51.8	27.8	72.2	94.7	84.5	53.6	103.5	68.7	86.4	327.8	156.6	31.1	47.8
343467	62.3	46.1	45.8	44.1	52.9	38.4	34.1	51.0	28.8	74.1	90.8	81.9	56.4	95.6	72.6	85.0	320.0	149.5	30.8	46.7

Sternum

with line at junction of keel + plate parallel to calipers

	a length	b depth at ant. end	c br. bast at post. ribprom.	ba	ca
Mck	128.6	69.6	67.5	54.2	52.4
K 2735	127.0	76.0		58.6	
F358	—	71.6			
F737		72.?			
	4/293 2				
	73.3				
343464	128.9	76.4	74.2	54.3	57.5
343467	121.1	72.5	69.4	59.7	57.3
343464	125.0	72.1	68.3	57.6	54.4
343442,	132.7	76.5	75.6	57.0	57.0
343465	118.8	70.5	66.7	59.4	56.3
343461	121.2	73.5	70.0	60.6	57.7
343463	116.8	71.6	65.1	61.3	54.7
	2/864.5				
	123.3				

	a	b	c	ba	ca
204 Eux,	115.4	65.8	67.1	57.0	55.2
19040	106.0	57.0		53.7	
Cir 730y	93.2	54.3	56.4	58.0	60.6

(original)

Meas. of Crabs

	gr Br across acum.	br Sh	Ratio		Jabin	gr Br	br Sh	Ratio	
B 5531	23.8	11.8	49.6		343462	(27.0)	(15.3)	(56.7)	24.6
K 2784	26.2	12.8	48.8	23.0	343465	(24.0)	12.6	52.6	21.8
H 5647	(23.7)	12.0	50.6	20.8	343461	24.7	(12.3)	49.8	22.8
F 334	25.8	(13.7)	(53.2)	22.7	343467	25.3	13.4	53.0	23.3
B 8120	24.5	12.2	49.7	20.8	343466	25.3	12.0	(49.4)	22.8
F 364	24.7	(11.4)	46.3	21.7	343468	24.6	13.0	52.8	22.3
H 5650	(26.4)	11.7	(44.4)	22.6	343463	25.0	13.2	52.8	23.1
H 5649	25.0	11.7	46.8		mean	25.1	13.2	52.4	
F 590	25.3	12.0	47.5	23.0	Cisquay 1534	18.0	9.0	50.0	16.4
B 8116 (53)	23.8	12.2	51.3		1234	20.5	10.0	48.7	18.7
mean	24.9	12.1	48.8		1304	17.8	9.3	52.2	15.6
Florida 12200	21.0	13.2	48.9						
					Cuxenna 242	19.5	10.3	52.8	17.5
					204	22.5	12.4	55.2	19.4

Coracoid

Material available.-- From Rancho La Brea, 25 nearly complete, 6 dorsal ends, 2 ventral ends; from McKittrick, ~~one~~ two complete; from Florida, 4 dorsal ends, two of which appear to be right and left of the same individual.

Description.-- Length 82.8mm. to 101.2mm., average 93.4mm; overlapping Jabiru (94.1mm. to ~~103.6~~ 105.0mm.) with average of ~~99.3~~ 100.7mm. and Euxenura (79.9mm. to 87.6mm.) averaging 84.1 mm.; Ciconia 69.4-76.6 mm.

Breadth across furcular facet 8 to ~~15~~ 4 per cent greater than breadth below facet, as in Ciconia and Euxenura; in Jabiru breadth of facet 18 to 24 per cent greater. Dorsal contour shallowly and evenly rounded with surface above nearly flat, clearly demarcated from bicipital attachment and extending almost to anteriormost tip of furcular facet. Contour and proximal surface definitely convex in Jabiru with peak of convexity slightly anterior to center of bone; line of demarcation from bicipital attachment less clear cut. Surface flat, definitely demarcated and short in anterior extension in Euxenura, with contour sloping off anteriorly from peak posterior to center and ending irregularly anteriorly due to termination of proximal surface. This surface ending back of anterior tip of furcular facet in Ciconia also, producing irregularity of contour; otherwise not unlike maltha, though slightly more undulating. Brachial tuberosity extending farther internally in maltha, C. ciconia and Euxenura than in Jabiru. Sterno-coracoidal impression markedly depressed in fossil, C. ciconia and Euxenura; practically no depression in Jabiru.

Leptoptilos differing markedly from all others in great anterior extension of furcular facet and adjacent portion of coracoid proper, and in having coracoidal fenestra in form of complete foramen.

The four dorsal ends of coracoid from Florida agree in everything but size with C. maltha. Two bones, apparently both of the same individual, have a breadth of furcular facet of over 26 mm., the largest of the western specimens measuring 25.8 mm. at this point.

DK 11/17/39

40
108
1 4 3

Stork Coracoid

RLB Specimens	a Length taken with lower half parallel to calipers T roughing at top	b Br. across fusc. near facet	c Br. below fusc. facet at level of centre of scapfacet	Ratio c/b
F 589	82.4	21.0?	17.7	84.3%?
F 976 ✓	87.3	23.1	20.0	87.0%
F 3141 ✓	88.5	22.6	20.0	88.6
F 371 ✓	89.6	21.9	19.9	86.4
F 626 ✓	90.9	23.0	19.8	86.1
H 3688 ✓	93.6	22.6 ✓	20.8	92.1
F 576 ✓	94.1	23.4	20.9	89.4
F 323	94.9	23.3	20.8	89.3
F 285 ✓	95.9	24.1	—	—
F 1010 ✓	97.5	23.6	20.4	86.5
F 346 ✓	99.6	25.9	22.3	86.2
F 311 ✓	101.2	—	22.0	—
McK. mean Florida 12200	96.0	24.9	21.8	orig. meas. not copied
"	—	26.5	23.4	88.4
"	—	26.3	23.6	89.7 orig. meas.
"	—	23.3	20.5	88.0
V 2800			21.0?	calculated
McK	91.1	—	22.0	
"	88.5	24.2	20.2	
	98.6	24.2	21.1	
	91.7	23.7	19.7	

specimen		a Length	b br fusc facet	c b sh.	Ratio c/b	
Dabéiumin zavail		94.1	24.7	20.2	76.4	
	av.	100.7	26.7	21.2	79.4	calculated then not copied
	max.	105.0	30.3	23.3	82.4	
Eurexenura min zavail max		79.9	19.0	17.7	93.2	
		87.6	21.3	19.5	91.6	
Cecónia min zavail max		69.4	17.9	15.6	87.2	
		76.6	21.0	17.4	82.8	

(93.0

1 Grad 57 / 15 8 9 3 / 15 3

1 Grad with hpfe ones

51 / 57 / 141

1033.1 / 82.8 / 92.9 (92.9 Caracol fossil stork

	length with arrow shaft parallel to foreleg & tibia at stance & tarsus to ground	qr (a) to carina fore facet	bk mx part (b)	ratio (ba)	qr depth mx	(ca)	depth to bk. tip (d)	da	qr at center of b facet e	ea	bk dist part			ex
F323	94.9	23.3	42.9	54.3	13.2	59.7	20.3	87.4	20.8	89.3			92.5	21.4
F626	90.9	23.0	41.3	55.8	12.5	58.3	20.0	87.0	19.8	86.1			89.0	22.0
F734		24.8	45.1	55.0	13.9	58.>	20.8	83.8	22.0	89.7			89.7	
F974	87.3	23.1					19.0	82.3	20.0	87.0			96.8	
F285	95.9	24.1					20.1	83.4	—				368.0	
K2738		21.8					19.0	87.2					33.0	(93.4
F1010	97.>	23.6					19.7		20.4	86.5	67.0	68.7	0.1	
K314	88.5	22.6			12.1		18.8	83.3	20.0	88.6			5	
F345	99.6	25.9			11.9		21.2	82.0	22.3	86.2			51.45	
F570	94.1	23.4					19.8	84.7	209	89.4			60	
K3688	93.6	22.6					20.0		20.8	92.1				
F371	89.6	21.9	40.3		14.4		18.9		19.9	86.4				
K3142		24.6					20.3	81.8	21.0	84.7				
F311	101.2		45.4						22.0		68.7	67.8		
	11 1039.1	(93.9												
flamdn 12200		26.6			14.1		23.3	84.3	23.4	88.4				
		26.0			14.0		22.8	87.7	23.7	92.0				
		23.3					20.1	88.5	20.5	88.0				
V2880									21.0					
589	82.8	21.1	38.5				19.3		17.6					
McK		24.9							21.8					

← revised for new table

Coracoid Recent Stork

	leng	gl. across facet	ht prox part	ratio ab	gl depth post. surf	depth thru tip (d)	da	gl at centre facet (c)	ca		ex
343467 L	99.3 / 4 = 24.4	27.1	48.6	55.7%							
343466 L	103.6	28.4	50.3	56.5	14.2	21.8	76.7	21.7	26.4	69.7	67.4	20.9
343464 L	100.7	25.4	48.6	52.3%	14.3	20.8	81.9	20.9	82.4	68.0	68.0	20.8
R		25.2										
343462	105.0	30.3	—	—	—			23.3	76.7			
343465 L	94.1	25.5	46.4	54.3	13.4	19.3	75.7	20.7	81.1	64.1	68.0	22.0
R		25.0				19.0	( )					
343461 L	100.1	26.7	49.3	53.8	13.1	19.6	73.5	20.8	77.9	67.0	67.8	20.8
R		26.6										
343463 L	97.9	24.7	47.0	52.6	13.5	19.8	80.2	20.2	81.9			20.7
Cic 203	7)705 = 100.7											
Cic 1944 L	75.1	17.3				14.7	84.0	15.6	89.3			
1334	68.8	16.8										
1304	76.6	21.0				16.8	80.1	17.4	82.8			
	69.4	17.9	4)289.9			14.5	81.1	15.6	87.2			
Eur 242	79.9	19.0	72.5			16.3	85.8	17.7	93.2			
204	87.6	21.3				16.2	85.3	19.7	91.6			
	2)1679.5 = 83.7											

49041 might have been 76.6 calculated from rest of skeleton? or 75.8 or 74.5 Rhea one 82.2 by reason articulated bone

59.9
89.6
75.5
82.0
4)325.0
81.2

69.4
76.6
2)146.0
73.0

75.1
70.0
76.6
3)221.7
73.8

76.6
76.6
2)146
73.2
72.8

68.8
76.6
2)145
72.7

coracoid

	(a) gr length	(b) length after meta-carpal shaft	ba	(c) Depth prox	(d) Wr Med	Wr trans thru shaft to ext cond	Wr trans thru shaft to int cond (B)	(e)	(f)	(dc)	ca			(da)	(fa)	(g)	(gc)
343467 L	140.1	80.5	55.4	30.8	20.0	47.6	43.4	64.7	71.0	65.0	21.9	11.0	11.7	14.2	31.0	13.8	44.8
343462	146.0	87.1	59.6	31.1	19.9	45.7	40.1	68.1	77.7	64.1	21.3	11.3	12.0	13.6	27.3	14.5	46.6
343465	132.0			29.0	18.3					63.2				13.8		13.9	48.0
343461	137.2			29.5	19.9					67.5		11.4	11.5	14.5		13.7	46.8
343467	138.9				19.7							10.9	11.3	14.2		14.0	
343466	140.1				19.3							11.0	12.0	13.7		14.8	
Rt 1334	117.8	69.7	59.3	23.5	15.4	39.2	35.0	60.0	67.3	65.8	19.9			13.1		10.4	44.3
203	114.7			23.7	15.6					65.8	20.7			13.6		10.1	42.6
Rt 204	122.1	69.3	56.2	26.4	17.0	41.4	37.3	63.7	70.7	64.9	21.6			13.9		11.5	43.6
242	114.7			24.7	15.7					63.6	21.5			13.7		10.5	42.3

⊙ ④

Humerus

Material available.-- From Rancho La Brea, 1 complete, 1 lacking proximal end, 7 distal end, 10 proximal end; from McKittrick, 1 distal end and 6 proximal end; and from Florida a cast of the type of Jabiru weillsi Sellards -- a complete specimen.

Description.-- In Euxenura the bicipital crest is relatively shorter and more extended at its distal edge than is the case in any of the other species, and it is therefore unnecessary to compare it further.

Papilla at proximal end of intermuscular lines on anconal face situated at a slight angle to these lines in the fossil, but not transversely placed as in Jabiru. An almost imperceptible muscle scar is present proximal to this near the median crest in the fossil and in Ciconia; this scar is farther removed from the median crest in Jabiru and more prominent with the shaft raised slightly at this point.

External surface of deltoid crest heavily bordered but depressed near the shaft. In Jabiru the survace of the crest is flat and rounds smoothly from the shft to the border. In Euxenura and Ciconia there is a faint depression as the crest leaves the shaft, but in neither does it equal the depression in the fossil. The border is slightly enlarged in Ciconia.

Ectepicondylar process of distal end more projecting and higher relative to breadth of distal end in the fossil than in Jabiru. Euxenura and Ciconia are colose to maltha. The ligamentary attachment of the entepicondylar prominence is more vertical in position in the fossil than in Jabiru and there is more surface facing toward the ulnar side.

Though the above characters are less clearly marked in the Florids cast due to casting, there is a general agreement with the fossils from California in the position of the muscle scars, the depressed deltiod crest the high entepidondylar process and the position of the ligamental attachment of the entepicondylar prominence. The cast differs from the Calif ornia specimens in larger size and greater distal extent of the pneumatic foramen.

Res. Stork - Humerus

	a	b post	c fossa perp cent	cb	ht ectepi cond perp d	b' dist e	ed	ba	ea
343462	276.3	54.8	46.4	84.2	22.5	45.7	49.3	19.8	16.5
343466	269.4	51.7	47.0	90.8	21.0	43.8	47.8	19.2	16.3
343461	262.1	50.5	45.7	90.7	21.1	41.8	50.4	19.2	15.9
343463	262.3	49.5	44.2	89.2	20.1	40.4	49.6	18.2	15.9
343465	252.8	50.3	45.1	89.7	20.4	40.4	50.5	19.8	15.9
343467	259.6	51.3	44.5	86.4	21.6	41.7	51.6	19.8	16.1
343464	264.6	53.6	44.7	83.5	20.3	42.0	48.4	19.8	15.8
	7)1847.1								
	263.8								
19940	219.9	41.7	34.9	83.5	16.1	32.3	49.8	19.0	14.7
242	213.8	42.0	33.5	79.7	16.6	32.7	50.7	19.6	16.0
49041	212.2	41.4	34.6	83.6	16.4	31.8	51.6	19.5	14.9
204	225.4	44.7	37.5	83.8	18.0	34.9	51.6	19.8	15.1
	4)871.3								
	217.6								
1334	216.2	40.3	37.4	92.9	17.0	31.3	54.4	18.5	14.4
1304	195.0	37.6	33.6	89.4	15.7	29.3	53.7	19.2	15.0
203	209.2	38.8	35.7	92.0	16.5	30.5	54.2	18.5	14.5
av 1947	198.0	37.8	32.5		16.1	29.6			
1304&2	196.2	37.0	32.4		15.6	28.8			
	4)817.4								
	204.3								

225.4
216.8
2)442.2
221.1

212.2
225.4
2)437.6
218.8

216.2
209.2
197.0
3)622.4
207.4

197.0
216.2
2)413.2
206.6

206.6
204.3
2.3

Fossil Stork – Humerus

	a	b proximal end	length straight centimeters c	cb	height of ectepicondylar process d	breadth distal end e	de	ba	ea
Ila. ✓	280 scarcely adult								
	~~291.0~~	54.7	50.0	91.4	22.8	43.3	52.7	18.7	14.8
C1538	(280?)	53.3	49.2	92.3					
F310		50.9	43.4	85.3					
B6041		51.4	45.5	88.5					
K315 2 ✓	250.2	48.2	42.0	87.4	20.5	38.0	53.0	19.6	15.4
F321 and B634	(276.3)				21.4	40.0	52.4		
C6420					20.2	38.8	52.2		
C3289					20.4	39.0	52.3		

2) ~~530~~
245.1

276.3

Ulna

None complete -- one nearly so, however (possibly measured 342mm in length. Judging from proportions of other incomplete specimens this nearly complete bone is above average in length; 10 proximal ends, 15 distal ends, 1 lacking proximal end only.

Lengths in Recent storks:

Ciconia	no. 1504 - 231mm	Euxenura	no. 49041 - 243 mm.
"	no. 1334 - 248	"	" 19940 255
		"	" 204 264

Jabiru, seven specimens: 318, 322, 322, 330, 341, 354, 357; average 335

The most outstanding distinction between Jabiru on the one hand and Euxenura and Ciconia on the other is greater excavation beneath the articular head on the palmar side and beside the enlarged prominence for the anterior articular ligament in the brachial depression. Small foramina characterize both areas in Jabiru while in Euxenura and Ciconia none are present in the brachial area. The fossil specimens, though badly pit worn and broken, show clearly the absence of foramina here and less prominent attachment of the ante ior articular ligament (thus resembling Ciconia and Euxenura. Further co parisonis not feasible in these incomplete specimens.

Carpometacarpus

Material available.-- From Rancho La Brea: ten complete, 2 lacking proximal end, 1 proximal half, 1 distal half; from McKittrick, 1 proximal end; from Florida, 2 complete, 1 lacking proximal end, 1 proximal end, 2 distal ends.

Size and proportions.-- ~~About~~ equal to, or slightly greater than Jabiru in length, though more slender of shaft and with less heavy head region. Rancho La Brea bones ranging in size from 129.5mm. to approximately 150 mm.; those from Florida ~~running~~ averaging a little larger (144.5 and 151.5 for the two specimens on which measurements can be taken); Jabiru 129.3 - 143.3 mm.; Euxenura galatea (113.0-120.8) and Ciconia ciconia (113.4-116.3) considerably shorter (not over 120.8 mm.) and Euxenura relatively stouter. High, short metacarpal 1 peculiar to fossil alone (ratio of height of M 1 to depth of trochlea: Rancho La Brea specimens, 51.9 per cent to 55.7 per cent; Florida specimens, 51.3 per cent to 54.3 per cent; Jabiru 56.2 to 61.8 per cent; Euxenura, 58.8 per cent to 59.9 per cent; Ciconia 59.5 to 60.5 per cent.

Description.-- External surface of head depressed between external ligamental attachment and posterior raised edge of trochlea as in Euxenura and Ciconia; Jabiru with external face puffy and blending into edge of trochlea without definite depressed area except ~~suggestion~~ for pit-like indentation immediately adjacent to ligamental attachment.

Internal surface of proximal symphysis nearly straight across at base of trochlea and metacarpal 1, with only a shallow depression near point of union of M2 and 3; similar to Euxenura and Ciconia, ~~and differing from Jabiru.~~ Jabiru with depression more pronounced and accentuated by ~~well-developed muscle scar of metacarpal 3~~ inward projecting ~~internally~~ on of metacarpal 3 and small foramina ~~usually~~ usually extending through the depression ~~and proximally~~ to base of pisiform process. Further pneumaticity noted in Jabiru, ~~noted~~ but not in fossil, in area anterior to trochlea.

Posterior view, upper part of metacarpal 3 straight-sided; in Jabiru this area irregular with internal side over-developed at

point of muscle attachment, and external side slightly deviated just beneath trochlea ~~as well~~. Ciconia closest to fossil and Euxenura also very similar. Leptoptilos similar to Jabiru, [illegible] the fossil

Distally, posterior angle of metacarpal 3 more ~~acute and~~ rounded, less rounded in ~~Jabiru than in~~ fossil, ~~or~~ Euxenura and Ciconia. than in Jabiru.

Calyptrotrachelus Fisher - Recent

	length of ext. side a	depth per end b	br. frach. c	br. M1 d	dist. from facet of M1 to tip of proc.	length of post. zygapoph. facet cond.	ba	cb ✓	db	eb	fa	x br. sin. mid.	y depth sin. mid.	yx	xy	yy	g length inter meta carpus spacer	ga	h length distal zygapoph.	ha	i length distal	ia
Exx.																						
242	113.2	24.7	10.5	14.5	15.8	37.7	21.8	42.5	58.8	64.1	33.3	8.5	6.7	78.8	13.0	10.2	65.3	57.6	11.8	10.4	13.7	12.1
204	120.8	26.5	11.6	15.6	17.0	40.9	21.9	43.7	58.9	64.2	33.9	9.0	6.8	75.5	12.9	9.8	69.4	57.5	12.7	10.5	14.4	11.9
49041	113.0	23.4	10.2	14.3	15.8	36.8	21.2	42.7	59.9	66.2	32.6	8.0	6.3	78.7	12.1	9.5	66.2	58.5	11.1	9.8	13.5	11.9
19940	116.5	23.9	10.1	14.1	15.3	37.8	20.5	42.3	59.0	69.1	32.4	8.7	7.0	80.4	12.5	10.1	69.3	60.3	11.5	9.8	13.9	11.9
	4)463.5																					
	115.8																					
Cic.																						
203	113.4	23.7	10.1	14.1	15.5	36.2	20.8	42.6	59.5	65.7	31.8	7.2	5.8	80.0	10.5	8.4	68.6	60.4	10.2	9.8	13.2	11.6
1337	116.3	23.5	10.4	14.2	15.5	38.4	20.2	44.3	60.5	66.0	33.0	7.6	6.0	78.9	10.9	8.6	69.6	59.6	10.5	9.8	13.9	11.3
1504	106.8	22.5	10.6	13.8	14.4	32.8						7.5	7.0				62.4		10.3		12.8	
av. 10	3)336.5	22.6	10.6	13.4	14.6	33.2						7.4	7.0				62.1		10.5		12.7	
	=112.1																					
343467	136.9	29.8	14.4	17.8	19.8	46.0	21.8	48.4	59.7	66.5	33.6	10.5	8.0	76.1	13.2	10.1	79.3	57.9	14.5	11.6	16.8	12.2
343464	138.9	31.0	14.0	18.0	20.0	47.8	22.4	45.2	58.2	64.6	34.4	10.8	8.1	75.0	13.4	10.0	80.6	58.0	13.3	9.5	17.4	12.5
343461	135.5	29.8	14.2	18.4	19.9	47.2	22.0	48.4	59.4	66.8	34.8	11.2	8.7	77.6	14.7	11.4	75.8	59.9	14.6	10.7	17.0	12.5
343463	135.3	28.8	13.7	17.8	19.2	46.6	21.2	47.6	61.8	66.7	34.3	10.4	7.8	75.0	13.2	9.9	78.4	57.4	13.4	9.8	17.2	12.7
343466	137.8	31.2	14.9	17.5	19.3	49.5	22.6	47.7	56.2	61.9	34.6	10.7	8.3	77.6	13.8	10.7	77.4	56.2	13.4	9.7	18.2	13.2
343462	143.3	31.2	15.0	18.1	20.0	45.6	21.7	48.2	58.1	64.1	31.4	11.0	8.2	74.5	12.6	9.4	86.9	60.6	14.1	9.8	18.4	12.6
343465	129.3	29.2	14.2	17.1	18.3	43.9	22.6	48.7	58.6	62.7	34.0	10.3	7.5	72.7	13.6	9.9	75.6	58.5	13.1	10.1	17.0	13.1
	7)957.2																7)554.0					
	136.7																79.1					
Leptotrachelus 205	159.0	32.5	15.3	20.2	22.0	56.6	20.3	47.1	62.2	67.7	35.3	11.2	8.3	74.7	12.5	9.3	84.3	55.7	16.1	10.0	19.3	12.0
34	154.0	33.5	14.9	21.4	23.0	52.0	21.7	44.5	64.0	67.6	33.7	11.9	8.2	68.9	13.5	9.3	88.3	57.3	16.5	10.7	20.7	13.4

Carpometacarpus – Stocks – fossil

F 310 143.6 30.5 17.5 —
K 2806 143,1 29.8 16.3 45,1

	a length of ext. alveo	b depth post end	c Br post trach	d br MI	e dist from facet MI & tip of proc	f length post. symphy. to ext. cond	ca	cb	✓ db	✓ eb	fa	x br at mid	y depth at mid	gx	xg yg	g length intermetacarpal space	ga	h length distal symphy.	ha	i depth distal link	ia
F409	144.5	28.3										9.7	7.4	76.3	10.7-8.1	91.2	—			17.3	
F1102	150.0	28.5	13.4	15.8	17.5	44.5		47.2	55.3	61.4		9.8	7.2	73.5	10.6	91.3	—				
F315	144.8	30.4	13.2	16.1	17.4	49.1	21.0	43.4	53.0	57.3	33.9	10.4	7.5	72.1	12,0 8.6	86.6	59.8	12.0	8.2	17.0	11.7
F944	144.5	—	13.4	—	—	47.3	—	—	—	—	32.7	9.3	7.0	75.3	10.6 8.0	87.1	60.3	12.5	8.6	17.1	12.8
F318	143.6	30.7	13.3	16.0	17.4	49.0	21,4	43.8	52.3	56.7	34.1	10.4	7.3	70.3	12.0 8.4	85.4	59.5	—	—	—	
F674	142.5	—	—	—	17.8	45.5	—	—	—	<		9.5	7.5	78.8	10.9 8.6	86.6	60.7	13.0	9.1	—	
F623	139.3	—	13.0	14.8	16.3	46.5	—	—	—	—		9.5	7.4	77.8	11.4 8.8	83.5	60.0	12.0	8.6	16.7	11.9
F997	137.2	28.7	12.7	14.9	16.3	44.4	20.9	44.3	51.9	56.8		9.2	7.6		11.0 9.1	82.8		12.2	8.9	16.5	12.0
K2004	137.9	28.5	12.8	15.0	17.1	47.3		45.0	52.6	60.0		9.6	7.6		11.1 8.8	86.3		10.7	7.7	16.2	11.7
F975	136.8	—	12.8	15.7	17.0	42.3		—	—	—		9.5	7.0		11.0 8.1	86.0		10.5	7.7	16.3	11.9
F594	133.0	—		16.1	17.2	47.7		—	—	—		9.6	7.0		11.1 8.6	80.8		11.6	8.7	17.0	12.1
D26.4	136.3	29.4	13.2	16.4	17.8	44.1		44.9	55.7	60.6		10.0	7.4		12.0 9.1	82.8		12.5	9.1	17.0	12.4
e8760	135.0	28.2	12.7	15.1	16.5	44.7		45.2	53.6	58.6		9.1	7.0		11.2 8.4	80.6		12.1	8.9	—	
J877649	129.5	26.4	11.7	14.3	16.0	~~40.2~~		44.4	54.2	60.6		9.0	6.8		11.9 8.4	80.1		11.0	8.5	15.6	12.0
MCK (omit in ave.)		31.7	14.4	16.4	18.2			45.4	51.7						14) 1191,1	85.0					
V2795	151.5											10.5	7.8	74.3	11.4 8.5	91.5	—	14.2		17.2	
V27985	151.5	32.0	13.6	16.4	18.3	48.3	21,1	42.5	51.3	57.3	31.8	10.4	7.7	74.0	11.2 8.3	92.2	60.7	13.9	9,1	16.7	11.0
V4577	144.5	30.8	13.7	16.7	18.4	48.7	21.3	44.5	54.3	59.7	33.7	10.4	7.8	75.0	12.3 9.2	84.2	58.2	14.5	10.0	17.0	11.7
12200	—	32.5	14.8	17.1	18.9	49.8		45.5	52.5	58.2					3) 2679 / 49.3						
12102																		12.3		17.1	
																		12.7		16.5	

Carpodacus

	length of ext. side	depth prox end	ht M_1	br ch mid.	depth ch mid.	length inter-meta carpal sp.	length dista symph
La Brea max	150.0?	30.7	16.4	10.4	7.6	91.3	13.0
mean	139.5						
min	129.5	26.4	14.3	9.0	6.8	80.1	11.0
McK	—	31.7	16.4	←	—	—	—
Florida max	151.5	32.0	17.1	10.5	7.8	92.2	14.2
mean	147.9						
min	144.5	30.8	16.4	10.4	7.7	84.2	12.4
Jabiru max.	143.3	31.2	18.4	11.2	8.7	86.9	14.6
mean							
min,	129.3	28.8	17.1	10.3	7.5	75.6	13.1

Femur

Mat. avail. Mc K & complete - La Brea #15 -

complete & nearly so, 3 prox., 9 dist. sharpled

Characters. — Anterior Border Fabian with, however, a more flared proximal end Trochanteric

The trochanteric area makes a low sweeping curve upward to the Fabian. The trochanteric crest lies with Eux. Ceroma.

The trochanter extends well above the articular surface curving inward slightly; in this char resembling Ceroid rather than Eux cuma. The

The intermuscular lines of the post. surface also agree with this pair in their union midway of the shaft

The continuation upward from here of a single line, contrasts with Fabian in which the two lines are distinct well above the center of the bone.

TSB.

Fossil Femur

Recent

	a length from proximal end of int. cond.	b length from articular adjacent to head to int. cond.	b/a %
McK	110.4	109.6	
" " (14)	117.2	115.8	16.8
✓ F906	115.6	115.5	15.7
✓ F416	118.5	118.2	16.6
✓ F782	112.0?	111.3	15.3
F588	116.3?	116.0	16.1
✓ F469	119.1	117.5	16.8
✓ K3030	122.7	121.8	16.8
K3031	116.6?	115.3	16.6
✓ F974	110.5	110.1	17.9
✓ B9250	(123.1+)	(121.9+?)	15.8
F591	(105.2)	(104.6)	14.8
McK	113.4	112.5	
" "	118.2	117.0	
" "	119.2	118.3	
" "	111.3	110.3	
" "	116.7?	115.4?	
" "	(123.2)	(122.7)	
	18) 2071.5		(115.0
	115		
	27		
	18		
	91		
	90		
	1		
	18		

	a	b
Cit Bi 130 V	85.0	84.6
Bi 1504	86.0	85.3
Bi 1334	94.2	94.0
	3) 263.9	
	87.9	
Emy 204	109.6	108.8
1944 0	106.4	105.8
49041	no femur	94.0 – 95?
242	101.1	100.7
	3) 315.0	
	105.0	
Jab. 343467	116.4	116.1
343466	120.7	120.2
343465	114.3	114.2
343464	118.6	118.5
343463	115.0	114.7
343462	(121.9)	(121.6)
343461	(112.0)	(111.8)
	7) 817.1	
	116.7	

84
94
2) 178
89

315
99
4) 412
103

or →

Tibiotarsus

Material available.-- From Rancho La Brea, 3 nearly complete, 2 with proximal tip missing, 12 proximal and 31 distal ends, 6 shaft fragments; from McKittrick, one complete young.

Description.--The outstanding character distinguishing the of this element is the shape of the ligamental attachment above the external distal condyle. The attachment in all the fossil material available, both eastern and western, is long as in Ciconia but less prominent. The attachment in

The attachment in all of the fossil material available is a prominent ridge, braodening distally, and with a pointed proximal end merging into the shaft.

In ~~length and prominence it agrees with Euxenura but~~

~~in this latter~~

~~a condition of the condition occurring~~

In Jabiru the attachment is a prominent papilla rather than a ridge.

The ridge-like nature of the attachment is common to both Ciconia and that of Euxenura, the former merging into the shaft proximally as in the fossil but lacking the prominence of the fossil, while in the latter the ridge is very prominent but juts out shraply from the shaft at its proximal end.

Copied

Tibio fasciata Forbes 322 est. near Dr ~~81 [illegible]~~ #1894 3

Material available. — Mc.K. one complete young 9 prox, 23 dist; La Brea 3 nearly complete, 2 with prox tip missing, 12 prox, 31 dist. 6 frags best

17/4/6/54

Size

Characters. — The ligamental attachment above the external condyle in both the La Brea & Florida fossils though long as in Ciconia rather than Jabiru is less prominent than the former. The attachment in Jabiru has the prominence of that of the Dail but is more papilla like. Euxenura is close to the fossil but the prox tip of the attachment ends more abruptly.

The ligamental attachment above the external condyle in the fossils is a prominent ridge, broadening distally & with pointed proximal end merging into the shaft It is most similar to Cic. in combined length & prominence tho in the latter the proximal end juts out more sharply than the shaft instead of merging with it as in Ciconia The merging at the prox. end is more like the fossil, the attachment being very prominent & papilla-like, not a ridge. In Jabiru is quite unlike the fossil, the attachment is very prominent & papilla-like, not a ridge. In Leptoptilos the attach is rel. small & irregular.

Proximal end — fossa. border of crest ~~border~~ very shallowly depressed in Su Bree, Eux. & Cic., ~~but a~~ more abruptly notched in Jabiru.

The distance from the base of the original crest at the proximal end to the tip of the ext. enemial crest is relatively greater in the fossil, Cic. & Eux. than in Jabiru & Leptoptilos. This area is even greater than in the fossil.

Narrower notch between condyles in Jabiru

Nasal Stoma = Tibia

	a	b dist ant	c depth ext. cond.	d depth int. cond.	ba	db	cd	bb dist post	be cranium regr	dist from int. Δ ext. cranium cran.	
F952	–	19.1	24.7	25.0		13.0	98.7				
F324	–	18.8	24.0	24.8		15.2	96.7				
K3150		20.4	24.6	25.6		12.5	96.2				
F283	372??	19.4	25.2	25.1	52.2	12.9	100.0				
F372	358.5?	19.8	24.9	25.7	55.3	12.9	96.7	15.0			
F613	–	17.2	22.3	23.3		13.5	95.7				
F945	315.0	18.9	23.2	23.5	60.1	12.4	98.7				
K2005	–	18.8	23.8	24.7		13.2	96.4				
F399	–	20.3	26.3	—		—	—				
F290	–	20.9	24.7	25.3		12.1	97.7				
F404	–	18.4	23.6	23.9		13.0	98.7				
F6771	–	20.4 20.0	24.7	25.1		12.5	98.5	14.7			
F403	–	18.7 18.6	23.3	24.2		13.0	96.4	13.6			
F390									24.8	16.5	66.6
F949									26.8	18.3	68.3
F286									27.5	18.3	66.6
F612									~~24.0?~~	~~14.0?~~	~~58.4~~
P380									24.0	15.7	65.4
F943									23.1	14.6	63.4

13) 23 13 193
13 19.9
121 38.?
107
43

316.2
392.0 ?
350 ? ?
1046.7
3 | 348.9

Fossil Snakes - Tibia

	a length & part attac.	b br. diam ant.	c depth ext cond	d depth int cond.	ba	db	d	br diam post e	least br shaft	ratio sh & length
F401 [9402]	316.2	19.3 ~~18.4~~	23.2	23.8	59.8		97.5		10.7	3.3
K2006 (D)	—	19.2	23.3	23.7			98.4			
K2541 (D)	—	19.4	24.6	24.6			100.0			
F356 (D)	—	19+?	25.0	26.0			96.3			
F593 (D)	—	19.0	23.5	24.1			97.3			
F583 (D)	—	18.0 18.4	23.2	23.7			97.8	14.2		
K2016 (D)	—	(21.3) 21.7	(26.4)	(26.2+)			100.0+	15.0		
F656 D	—	19.3 19.6	25.4	26.0			97.7	15.6		
F6768 (D)	—	18.2	24.3	24.0			101.0	13.7		
K2007 (D	—	18.3	—	(22.3)			—			
D9730 (D)	—	18.0	(22.7)	23.4			97.1	14.3	79.5	
K2002	—	18.4	23.7	23.7			100.0			
K2517 and K2963	324.0	7)18.9								
11684	—	(18.5)	—	24.9a		13.4				
12200	—	(19.4)	24.4	25.1		12.9	97.4			
12200	—	19.3	23.9+	25.3		13.1	94.6			
~~F945~~ and F953 = MCK group	315.0								10.8	3.4
no figure, estimate	363.0									
no figure, estimate F283	357?								11.3	3.1
no figure, estimate F2995, F3500	372?								11.7	3.1
	371?									

Ala

	br diam	dept ext	dept int
Norwich	26.4	26.6	
13200	19.4	25.0	24.4
12200	19.4	25.2	23.8
~~F~~ Idaho			
316.2	18.6	25.0	
324.0			
315.0			
363.0			
357.0			
372.0			
371.0			
7)1418.2 (345.4			
21			
31			
28			
38			
35			
32			

Rec. Stork Tibia

	a length & shaft diameter	b dist ant	depth ext cond	d depth int. cond.	Ratio ba	dlo	cd	e br. dist post.		br. cnem. index	dist from ant to ext. cnem. crests		length br shaft	ratio br. to shaft length
Ext														
49041	293.2	(16.8)	20.4	(20.9)	61.5	12.4	97.7			22.8	14.5	63.6	9.1	3.3
19940	282.5	17.3	20.0	21.4	61.3	12.3	93.5			22.6	14.5	64.7	9.6	3.4
204	309.8	(18.8)	22.4	(22.5)	61.0	11.9	94.4			26.7	17.0	63.7	10.3	3.3
242	283.2	17.0	20.5	21.2	60.3	12.4	96.7			24.0	15.6	65.0		
	4 1149.0 287.2													
Cic.														
1334	258.4	15.6	18.6	19.5	60.3	12.5	95.4			21.4	13.5	63.2		
203	251.3	17.3	18.7	19.1	56.1	13.3	97.9			21.0	13.3	63.4		
1504	239.8	14.3	17.0	17.8						19.8	12.2?	04.8		
	239.2	"	"	17.4						19.6	12.7		8.2	? Y
rabum														
343462	(394.7)	(22.2)	(27.4)	28.6	56.5	12.8	93.7	16.0	72.2	29.3	17.6	60.2	12.5	3.1
343464	310.0	20.0	26.8	(28.8)	54.2	14.4	93.3	16.7	83.4	28.3	17.2	60.7	11.9	3.2
343464	368.5	20.0	24.4	27.0	54.5	13.5	90.4			24.7	12.6	53.4	12.1	3.2
343467	368.5	19.5	25.2	26.7	53.5	13.6	94.4	15.3	78.5	25.1	14.4	57.4	11.6	3.2
343463	354.8	(18.2)	(23.8)	25.1	51.5	13.7	94.7	15.5	85.3	24.6	13.4	54.5	11.4	3.2
343461	349.2	18.8	24.7	25.8	54.0	13.7	95.7	15.9	84.7	26.5	15.2	57.4	11.7	3.3
343465	(347.8)	18.6	23.9	(25.0)	53.6	13.4	95.6						11.3	3.2
	7 2434.3 1373													
	347.6 196													
Leptotyphlops														
205	340.7	(14.2)	25.5	26.0				14.7?		25.6	17.7	69.2		
34	344.3	19.5	24.9	25.0						27.8	20.6	74.2		

64.8
196) 127.0
117.6
9.40
9.80
34.968

2872
4) 11490
8
34
32
29
28
10

2510
753.2

239.8
239.2
498
2) 498
249.0

309.8
283.3 (296.6
2) 593.3
9
19
18
13
12
1.7

Tarsometatarsus

material available

Rancho La Brea – malotka

11 ad. 7 wdgt 5 ad. 9 complete
12 ad. 12 shafts stillapp dig 10 very gg proximal end distal

Leptoptilos crumeniferus — 2 rts, 2 lefts complete

Ciconia sp. — 2 lefts 1 rt. complete

Euxenura galateae — 2 rts, 2 lefts "

and breadth of shaft in the middle ~~F~~ relatively ~~narrower than~~ denser ~~F~~ ~~D~~ the length averages the same in the two. There is in the Pranhus however, an angularity of edges which compared with the more rounded surfaces of Labrus give the bone an appearance of slenderness.

The detailed characters are

copy 2
11/16/39

Tarsometatarsus

Material available.-- From Rancho La Brea: 13 complete, 28 proximal ends, 24 distal ends. From McKittrick: 1 complete, 20 distal ends; from Florida: 1 proximal end, 2 distal ends. About one-half of the La Brea specimens exhibit the roughness of texture which characterizes the immature bone. ~~This fact may have some bearing upon the slightly smaller average breadth of tarsus in the La Brea material as compared with that from McKittrick, where young individuals are fewer.~~ In the matter of length, however, the longest fossil specimen is one of the immature bones, and, with the exception of the type (which is diseased and thus possibly stunted in growth), one immature and one adult bone, practically identical in length, are the smallest specimens.

Description.-- General characters similar to Ciconia ciconia and Euxenura, though 25 to 30 per cent greater in size than the former and barely overlapping the latter. Length more closely approximating ~~available specimens of~~ Jabiru mycteria ~~and Leptoptilos crumeniferus, though more slender than the latter~~. Breadth of articular ends averaging the same in proportion to length as in Jabiru, but angularity of edges in fossil compared with rounded surfaces of Jabiru gives fossil appearance of greater slenderness. Distally, shaft of fossil narrowing in abruptly above trochleae slenderizing this area as compared with Euxenura or Jabiru ~~or Leptoptilos~~. Hypotarsus, also, more slender in maltha than in Jabiru ~~or Leptoptilos~~: greatest breadth of this area relative to breadth of proximal articular surface, 52 to 60 per cent in maltha, 51 to 53 per cent in Ciconia, 55 to 57 per cent in Euxenura and 62 to 64 per cent in Jabiru ~~and Leptoptilos~~.

Other diagnostic characters of hypotarsal region in maltha compared with Jabiru:(1) Entire hypotarsus noticeably set off from proximal end by straight drop down from articular surface and marked excavation between the narrow calcaneal ridges. Area only slightly depressed in Jabiru and borders never distinct narrow ridges; position less distant from proximal end with more gradual drop. Fossil closer to Ciconia and Euxenura

though excavation not always as marked. ~~No excavation in Leptoptilos and hypotarsus with broad connection to main body of proximal end slightly below articular facets.~~ (2) Calcaneal ridges more slender and more pointedly extended proximally ~~(nearer Ciconia and Euxenura)~~. (3) Facet-like surface of external ridge longer, always exceeding internal ridge in length and 31 to 48 per cent greater than breadth of hypotarsus; in Jabiru internal ridge sometimes exceeding external in length of facet but neither ever more than 12 per cent greater than breadth of hypotarsus. (4) Adjacent to hypotarsus, lines continuous with posterior border of shaft -- externally -- turning forward more abruptly and higher on shaft; internally -- inconspicuously merged with base of hypotarsus contrasting with Jabiru in which hypotarsus depressed from sharp internal edge of shaft.

Intercotylar tuberosity relatively broader and more blunt at tip in fossil than in Jabiru and apparently more inclined toward external side. Slight excavation present at base of tuberosity on external side though much less marked than in Jabiru. Breadth and slant of tuberosity agreeing more closely with Ciconia and Euxenura, but excavation at base on external side absent in these genera.

In addition to narrowing of shaft above trochleae (noted above), only one diagnostic character evident for distal end, i.e. more pointed posterior tip to internal trochlea than in Jabiru, thus resembling Ciconia and Euxenura, but seemingly fuller above with gradual downward slope to tip.

The Florida bones agree in all ~~particulars~~ represented characters with the description given above.

	Length	Br. dist.	Br. prox.
La Brea	259-320	23-28	20-24.5
McK.	310	24.3	21.8, 24.6
Fla.		26	23.3
Cuba	___	___	

copied from orig. not checked as yet. 11/[illegible]/34

Fossil Stork Tarsi

Specimen	a Length	c Br max (ant.)	c Br dist	d Br hypo ydims	e Length ext calc ridge	b Length int. calc ridge	Ratio e to d	Ratio b to d	x Br inter cotyla dub	y Br inter cotyla dub.	Ratio xy	br lig. facet	length lig. facet	Ratio br lig facet to br. max.	Dist. from inter cotylar notch to edge of hypo.	Ratio to br ant. prox.	Ratio d to b
F309 yg yg	319.7	23.4	25.8	12.8	16.8	16.0	131.1	125.0	6.2	7.3	85.0	6.0		25.6	7.9	33.7	
R F295+314+367	318.0	23.0	26.2	12.7	16.7+	15.0+	131.5	118.1	6.2	7.4	83.8	5.5		25.0	7.6	33.0	
F293+287	309.6	24.4	26.3	12.9	17.4	15.7	138.8	121.7	6.8	7.3	93.3	6.4		26.2	7.2	29.5	
L K 357	306.0	23.2	25.8	13.0	17.2	16.9	147.8	130.0	7.2	8.2	87.8	6.0		25.8	7.9	34.1	
K 356	290.0	22.4	25.1	12.3	17.0	16.0	138.0	130.0	6.5	8.0	81.3	5.4		24.1	7.2	32.1	
L K 1025	288.9	21.4	23.8	11.6	16.9	15.0	145.7	129.1	5.7	6.8	83.8	5.1		23.8	6.0	28.0	
R F470+379	287.9	21.7	23.7	11.5	16.3	14.4	141.8	125.1	—	—	—	5.4		24.8	6.8	31.3	
R K 355 yg	277.7	21.7	23.0	11.8	16.9	15.5	143.1	131.2	6.1	6.9	88.4	4.8 wk		22.1	7.9	36.4	
F440+357	275.9	22.2	24.3	12.8	17.0+	15.3	132.8	121.0	6.2	7.4	86.5	5.4		24.8	6.4	28.8	
U.C. #30928 loc. 2050	309.1	—															
yg & warped loc. 2051	275.5	—	24.7						5.3	7.0	77.3?						
loc. 2050 #30920?	273.5	23.5							6.3	7.4	85.2	5.3	7.4	22.5			
loc. 1059 #11202 Type	257 asis 259.6 calculated length	20.1	23.3						5.3	7.2	73.6?						
McK. spec.	310.1	22.8	26.3	13.2	20.7	18.9	157.0	143.2	6.5	7.7	84.4	6.2		27.1	7.7		58.0
" " (22) (13) 341.9 293.5		21.4 22.9 24.5	24.3 min 26.1 av. 28.1 max														
Florida 12098	—	—	26.0														
V 4724	—	23.3	—	13.7	19.5	18.0	146.2	135.1				6.3		27.0	8.0		57.6
Cuban 6197	—	24.3	—	14.0 op.	—	18.2		130.0 op.				6.4			8.4		
33 Specs.)		20.1 min	23.0														
		23.0 aver	25.6														
		24.6 max	27.7														

341.9 / 293.5 = 1.2 / 0.1 / 92.9 / 14.7 / 2.9 / 0.1

293.5 / 41.9 = 7 / 13 / 38 / 26 / 124 / 117 / 71 / 63 / 8

Dist. from inter cotylar notch to edge of hypo.

320 / 256 / 64

2420 / 2883 / 53.9

Jessie - Stocks (1) Taurus

	a Tarsus length	b Gr hum.	c br dist	d least br. Rad	Ratio ba	Ratio ca	Ratio da	db	e br hypotenuse	f length ext hypo ulna	g length int calc ulna	e to shortest ulna	e to longest ulna	eb	lens & liq at F	br liq at F	Ratio	Ratio de	ht Rad to MII	fb length
293+287		24.7																		
F309	320	23.3	25.9	9.3		8.0	2.90		12.7	16.4	15.6	81.4	67.5	54.7	8.6	5.3	61.6	36.2	38.8	12.1
F 295+314 +391	318	23.1	26.1	9.6		8.1	3.02		12.7	16.2	13.7	91.3	77.2	55.0	8.7	5.3	60.8	36.9	32.2	11.7
K3157	306	23.2	25.8	9.1		8.3	2.97		13.0	18.7	15.2	85.4	69.5	56.1	—			35.7	36.0	11.6
K3156	292	22.5	25.1	9.7		8.5	3.32		12.1	18.6	15.2	79.6	65.2	54.3	9.0	5.1	56.7	39.0	35.8	12.3
K1025	289	21.8	23.8	8.3 (d)		8.2	2.87		11.4	16.9	14.6	78.2	67.5	52.7	8.2	4.8	58.6	35.0	32.5	11.2
F470+379	288	21.6	23.7	8.4		8.2	2.92		11.3	15.0	14.1	80.3	75.4	52.3	7.7	4.8	62.3	35.4	33.4	
K3155	278	21.9	23.0	8.5 (d)		8.2	3.05		11.7	16.7	15.0	78.1	70.9	54.0	8.3	4.0	48.3	37.3	35.3	12.7
F440 + F357	276	22.5	24.8	9.4		8.8	3.40		12.7	16.0	15.3	83.1	79.4	56.5	7.8	5.0	64.1	38.8	35.1	12.3
Miller's spec. source	307																			
" "	314																			
Type 1802	256	20.7	22.9	9.0																
F342		24.1							13.6					56.5	9.2	5.7	62.0			
F867		24.1							13.8					57.7	8.8	5.7	64.7			
F950		20.8							11.8					56.7	8.7	5.1	58.7			
F293+F287	309.5	24.1	26.2	9.7					12.7					52.7	8.6	5.7	66.3		37.3	
F368		23.4							12.8					54.7	8.4	4.7	56.0			
F905		22.3							13.4	17.5	14.7	91.8	76.6	60.1	8.0	5.4	70.8			
F440		22.2							12.6					56.7						
F400																				
V4724		23.2		10.4					13.3	19.5	18.0									

Fossil Birds Tarsus (2) dist. ~~Hd good~~

	a length	b dist. trochl.	c br. mid trochl.	d depth int. trochl.	e ht. facet for fib. from dist. end of facet	ba	ca	dla	b br. shaft thru dist.	dist. ch. above M facet	fa	ratio b to a per cent	mid depth shaft ornat.	ratio	br. shaft mid	ga	x length ext. calcaneus	y length int. calcaneus	ratio x to gr. br. hypo	ratio y to gr. br. hypo
F309 M	319.7	25.8	9.3	14.3	25.7	8.07	3.81	55.5	11.3 93.0	12.3	3.85	71.8	9.1	95.3	10.5	3.29	16.8	16.0	131.1	125.0
F295 etc M	318.0	26.2	9.3	14.7	25.6	8.24	2.82	56.2	11.4 94.0	13.1	4.13	72.6	9.0	89.8	10.8	3.40	16.7+	15.0+	131.5	118.1
F293+287	309.6	26.3	9.6	14.6+	25.5	8.5	3.10	59.5	11.4 94.3	13.9	4.2	73.4	9.5	87.8	11.3	3.65	17.9	15.7	138.8	121.7
K315? X	306.0	25.8	9.5	14.6	25.1	8.41	3.11	56.7	11.5 93.3	13.0	4.25	82.6	11.5	88.1	10.7	3.50	19.2	16.9	147.8	130.0
F315 6 X	290.0	25.1	9.5	14.1	24.8	8.65	3.28		12.0 95.7	12.8	4.32	75.9	10.5	78.6	11.5	3.97	17.0	16.0	130.0	130.0
K102 ?	288.9	23.8	8.3	13.3	21.6	7.96	2.99		10.8 87.0	12.1	4.3	79.0	9.0	88.7	9.4	3.25	16.9	15.0	145.7	129.1
F470 379	287.9	23.7	8.4	—	23.0	7.97	2.92		11.0 87.3	12.7	4.24	75.2	9.0	88.4	9.6	3.45	16.3?	14.4	141.8	125.1
K315 5 M	277.7	23.0	8.8	13.3	25.0	8.02	3.16		10.6 93.3	11.3	4.07	78.0	8.8	91.7	10.3	3.72	16.9	15.5	143.1	131.2
F440 +357 X	275.9	24.3	8.8	14.0	24.0	8.83	3.19		11.1 90.3	12.2	4.43	76.6	9.2	91.3	10.0	3.63	17.0+	15.5	132.8	121.0
	9) 2240	24.9	8.15	9.1		9) 74+66	8.29								9) 3186	3.54				
						32 26 18 86										23 46				
V4724																	19.5	18.0	146.2	135.1
12098		26.0	9.5																	
Mean	310.0	26.2	9.8																	

319.7
275.9
33.8

Fossil Fork Farm (2) prox. end meas' & copy

length + prox end meas.

	a length	b bx post. art. facet	c bx prox. a'broadest post/ant	d length biga. facet	e bx biga. facet	f depth prox end art.	ba	db	x bx situat. tub.	y length situat tub	xy	ld	x6	fb ✓	h bx hypo. celum	i bx hypo. fenestra	kb ✓	ib ✓	hi	yb
F309	319.7	23.4	24.8	—		12.8	73.3	~~38.~~	6.2	7.3	85.0	—	26.4	54.7	11.4	12.8 (4.0)	48.7	54.7	89.2	31.2
F295+314+301 R	318.0	23.0	24.4	8.8	5.6 (27.3)	12.7	72.4	38.9	6.2	7.4	83.8	63.7	26.9	54.3	11.3	12.7 (3.9)	49.2	55.1	89.1	32.1
F293+287	309.6	24.4	25.7	8.4	6.4 (26.2 avg)	13.1	78.8	34.4	6.8	7.3	93.3	76.3 (avg)	27.9	53.7	11.2	12.9 (4.1)	46.0	52.8	86.6	29.9
K315 7 L	306.0	23.2	24.2	—	—	12.9	75.9	—	7.2	8.2?	87.8	—	31.0	55.6	10.8	13.0 (4.2)	46.6	56.0	83.2	
K315 6 X	290.0	22.4	23.7	8.6	5.3 (23.7)	12.2	77.3	38.4	6.5	8.0	91.5	61.6	29.0	54.5	10.4	12.3 (4.2)	46.4	55.0	84.6	
K1025 L	288.9	21.4	23.0	7.7	5.1 (23.8)	11.8	74.1	34.0	5.7	6.8	83.8	66.3	26.6	55.2	10.3	11.6 (4.0)	48.3	54.3	88.9	
F470+379 R	287.9	21.7	22.8	7.3	5.2 (23.9)	12.0	75.6	33.6				71.3	—	55.3	10.3	11.5 (4.0)	47.5	53.0	89.6	
K315 5 R	277.7	21.7	22.6	—	—	12.0	78.3		6.1	6.9	88.4	—	28.1	55.3	10.6	11.8 (4.2)	48.8	54.4	89.8	
F440+357 X	275.9	22.2	24.1	7.4	5.4 (24.3)	12.2	80.6	33.2	6.2	7.0	88.5	73.0	27.9	55.0	10.8	12.8 (4.6)	48.7	57.6	84.5	
F392	—	22.0	23.0	8.2	5.4 (24.5)	—		37.2	—	—		65.8			10.7	12.6	48.6	57.3	85.0	
F950	—	21.1	22.5	8.7	5.3 (25.0)	11.7		41.3	6.4	7.5	85.3	61.0	30.3	55.5	10.6	12.2	50.3	57.8		
F867	—	24.3	25.4	8.9	6.0 (24.6)	13.3		36.7	7.1	7.9	89.8	67.5	29.2	54.7	12.5	14.1	51.5	58.0		
F368	—	23.7	25.3	—	5.2 (21.9)	12.1		—	6.7	7.5	89.3	—	28.3	51.1	11.4	13.0	48.2	54.8		
F400 (439)	—	21.7	22.8	7.5	5.5 (25.3)	12.2		34.5	6.4	7.4	86.5	73.3	29.4	56.3	10.8	12.2	49.7	56.3		
									6.3	7.4	84.2									
									5.4	7.0	77.3			10.5						
									5.3	7.2	73.4			11.0	12.5					
V 4724		23.2							7.0	8.3	84.3					13.3				

av. 2920

V.C. after. brachoor angle

pet 2050 #309 28 309.1

pet.. 309 20?. 273.5 23.5 Bifid ant. 10.5 Bifid post. 10.0 7.6 5.3

pet #11302 1059 type 257 Bentaoing corner 259.6 20.1 Bifid ant. 10.5 Bifid post. 10.0

pet 2051 by wrapped 275.5 —

13) 3791.4 291.6

6 8 6.2 / 80.6 / 5.6 (7.57)

9) 68 6.2 7.62

63 / 56 / 59 / 22

8) 60 / 56 / 45 / 40 / 56

V 4724 Rec. 322? 290?

Recent Storks (1) old copy

Jabiru		a pectoral length	b bill depth	c bill dist	d least bill dep	Ratio ba	Ratio ca	Ratio da	e bill hypotarsus	f length ext. calcaneus	g length int. calcaneus	Ratio g to OK Shortest wing	Ratio e to OK Longest wing	e6	Length lig. at.	bill at	Ratio lig at.	Ratio da	bill gonial MI	to length	to e ratio Longest calcaneus br. hypo
	L	341.5		29.6			8.68		15.7	16.7	16.4	95.7	94.0	62.8	9.1	6.3	69.3	36.4	42.4	12.4	106
343462	R	342	25.1	29.4	10.7		8.66	3.13	15.8	17.0	15.7	97.5	90.0	61.5	9.3						107
	L	316.8		28.4			8.96														
343466	R	320.0		28.0	10.0		8.76	3.42	14.8	16.3	15.0	102.1	96.8	68.7	8.0			36.0	41.0	12.8	110
	R	312.0		28.3			9.07		14.3					62.3					39.6	12.7	
343464	L	310.3		27.8	10.1		8.96	3.58	14.3	14.6	17.2	98.0	91.0	61.7	8.7			36.0			118
	L	303.6		27.6			9.11		15.0	17.1				64.2	8.7						
343467	R	305		27.7	10.0		9.10	3.6	14.6	14.8	14.3	103.6	100.0	65.5	8.4			36.6	41.2	13.5	100.0
	R	305.3		25.7			8.73		14.5	14.6											
343463	L	303.6	22.0	25.8	9.4		8.52	3.1	14.1	14.2	14.1	100.0	99.4	65.0	7.5	5.9	78.7	36.4	41.5	13.5	100
	L	298.7		25.7			8.61			15.5	15.8										
343461	R	298.0		26.0	10.2		8.73	3.43	14.3	13.3	15.7	93.5	91.2	62.6	8.7	7	73.4	39.5	40.1	13.4	110
343465	R	288.3		D	10.3			3.58	14.2	13.7	14.07	103.6	96.5	64.5	7.5	5.5		34.1			
"	L	290		27.5	10.1			3.48	14.1	14.9	15.6	98.0	95.3	64.0	7.3			37.3	40.8	14.0	110
Miller's		302	23.8	25.7				3.													97.5 3
Extremera 204		267	22.0	24.5	9.3		9.1	3.40	12.5	16.5	14.8	84.5	75.7	57.0	7.5	5.8	77.3	37.1	R 34.1 L 34.2	12.7	108
Bi 242		239	19.7	22.7	8.4		8.5	3.55	10.9	14.0	13.0	83.9	78.0	55.5	6.7	4.7	72.3	37.1	31.4	13.1	
19440		247	21.5	22.2			9.0														
49041		230	20.0	21.8			9.4														
Ciconiei Bi 1334		230	18.2	19.7	7.2		8.5	3.69	9.3	13.5	11.4	81.6	68.9	51.1	6.3	4.8	76.2	43.1	R 28.8 L 28.9	12.4	
203		218	16.5	19.1	6.8		9.4	4.63	8.9	11.9	10.6	84.0	74.7	54.0	5.7	4.4	77.3	49.2	27.1	12.3	

230.0
205.0
2)435.0
217.5

Recent Strix taxa (2) Prox. end mens

	a length	c br post. orb. front.	c br post. frontal ant.	d length lit. facet	e br lig. facet	depth post.	ba	db	x br interart. tub	d length tub.	xy	ed	fg	x6	y6	fr br lingua (dent.)	ir br lingua (greatest)	rb gb	ib hb	li gb
Cic. alba																				
1334 L	229.5	18.3		5.0	6.2	9.9	79.8	33.4	4.9	6.0	81.6	80.7	54.1	26.7	32.8	9.0	9.4	49.2	51.3	95.6
av. R	230.2	18.2		4.4	6.4	9.8	79.2	35.1	4.5	6.0	78.1	71.8	53.7	24.7		8.8	9.5	48.3	52.2	92.5
2034 Q	218.8	16.8		4.7	5.8	8.8	76.7	34.3	4.7	5.5	85.4	81.0	52.3	27.9	33.3	8.0	9.0	47.7	53.8	88.9
1504 R	205.0	16.2				9.0			4.1	5.1						8.2	9.8			
	653.8																			
	217.9																			
Eurnyn.																				
204 L	267.3	22.3		6.0	7.3	12.1	83.6	32.7	6.1	7.2	84.7	82.3	52.0	27.3	32.3	10.4	12.1	46.6	56.5	82.6
R	267.8	22.2		5.8	7.7	12.5	83.3	34.4	6.3	7.1	88.7	75.3	53.9	23.4	32.0	10.0	12.3	45.2	55.5	81.4
19440																				
R	246.6	20.4		5.8	4.7	11.1			5.5	6.2						10.0	11.0			
242 L	239.5	19.9		5.1	6.3	11.1	83.3	32.6	5.5	6.4	86.0	78.5	55.7	27.6	32.1	9.7	11.3	48.3	56.7	85.8
R																				
49041 R	224.4	19.4				10.9			5.1	6.4						9.8	11.2			
Leptoptila																				
205 L	281.7	22.7		6.7	8.7	14.5	80.7	38.4	6.2	8.0	77.5	76.9	61.3	27.3		12.9	14.6	56.7	64.4	88.5
R	280.7	23.0		6.4	8.3	14.6	82.0	37.7	6.2	8.2	75.6	77.1	63.5	27.0		12.5	14.5	54.5	63.2	86.3
34 L	262.2	22.8		6.3	7.6	15.0	91.0	33.4	6.7	7.8	86.0	82.8	65.7	29.4		11.7	14.1	51.3	61.9	83.0
R	262.0	22.9		6.2	7.8	15.0	91.3	34.1	6.5	7.9	82.3	79.6	65.6	28.4		11.8	14.1	51.6	61.7	83.7

use this (2) distal

	a length	b to dist trach	c to mid trach	d depth int trach	width facet thru mid trach and midpoint	ba	ca	db	ratio length calc. bet to pt			g to sh mid	ga ave 3.53	x length ext calc ridg	y length int. calc ridg	ratio x	ratio x 100 bi-hyp	ratio y 100 bi-hyp	sh ang. dist. ant.
Jabim																			
343462R	342	29.6	11.0	16.3	31.0	8.65'	3.22	55.1		68.7	12.8	3.7	11.4	3.34	16.8	16.6	98.7	107.0	105.7	14.2 80.4
343466R	320	28.0	10.7	16.2	29.5'	8.74	3.34	57.8	316.5'	66.2	12.5	3.9	10.7	3.34	16.5	15.5	94.1	107.8	101.1 109.5	13.0 82.4
343467L	310.3	28.0	10.2	15.4	27.9	9.01	3.26	55.1		68.7	12.2	3.9	10.7	3.45	14.8	16.0	108.0	101.2	123.2	13.7 78.3
343463R	305.5	25.7	9.3	14.4	31.0	8.43	3.05			65.6	11.0	3.6	10.4	3.41	14.7	15.0	102.0	101.2	103.4	12.7 82.1
343467L	303.6	27.7	10.4	15.0	29.8	9.14	3.43			63.5'			10.8	3.63	15.1	14.6	96.7	100.0	96.7	13.1 82.5
R	305.0	27.8	10.3	14.8	29.7	9.13	3.37			62.7	11.4	3.6	11.3	3.71	14.7	14.6	99.4	98.7	98.1	13.2 85.2
343461L	298.7	26.0	9.5'	15.0	28.3	8.71	3.17			67.9	12.1	4.0	10.8	3.62	15.4	15.8	102.5'	107.0	109.9	13.5 80.1
343465L	290.0	27.6	9.4	14.5	29.8	9.52	3.24			66.4	11.2	3.8	10.7	3.69	14.8	16.0	108.0	104.1	112.7	13.3 80.6
	3)279.3	3)309.9				3)71.35	8.92													
	93.1	103.3				23.78														
Cic: Cic, 1334L	224.7	20.0								76.5'			7.9	3.44	14.0	11.6	83.0	148.9	123.6	
R	230.2	20.1	7.1	11.3	19.8	8.73		56.3		76.9			8.0	3.44	14.0	11.2	80.1	159.1	127.2	8.9 89.0
1504 203 R	205.0	19.8	6.6	10.0	17.5'								7.0		12.1	10.9				
L	218.8	19.3	7.2	10.9	18.1	8.73		56.5'		70.3			7.3	3.33	11.8	10.5	89.1	131.1	116.7	8.3 88.2
Emy. 204 L	267.3	24.7	9.3	12.4	24.9	9.25'		50.2	262.6	73.3			9.8	3.67	16.8	15.1	90.0	133.2	120.0	11.6 84.4
1440R	246.6	22.3	8.6	12.8	23.5'								8.8		13.5	12.3				10.7
242L	239.5	22.9	8.6	12.9	22.0	9.56		56.4		71.3			8.7	36.4	14.2	13.2	93.0	125.7	116.8	10.0 87.0
uyier 4904 R	229.4	22.3	8.4	11.8	20.0								7.5'		broken	12.8				
	49828																			
	245.7																			
Rept. 205 L	281.7	28.4				10.1				73.2			10.7	3.8	16.6	15.4	92.7	113.6	105.4	13.2 81.2
R	280.7																			
134 L	262.2	26.8							2	65.3			9.8	3.74	15.0	14.2	94.7	128.0	110.1	12.5 78.4
R	262.0	26.8				10.2			259.	64.3			9.8	3.77	14.7	14.8	100.1	124.5'	125.0	12.4 79.0

Storks — Tarsus of recent & fossil compared

	Length		br. prox. art. surf. rel. to length		br. dist. rel. to length		br. sh. at mid rel. to length		gr. br. hypo rel. to br. prox. art. surf.		length of longest facet on calc. ridge rel. to gr. br. hypo.		length of shortest facet on calc. ridge rel. to gr. br. hypo.		long facet is	length ext. calc. ridge rel. to prox. end		length ext. calc rel. to hypo	
Jabiru 7	342	290	7.86	7.13	9.52	8.43	3.71	3.53 3.34	64.3%	61.7%	112.7	98.7	105.7	96.7	4 ext 3 int.	68.7%	62.7%	107.8	98.7
Leptoptilos[2]	281.7	262.0	9.13	8.07	10.2	10.1	3.80	3.74	64.4	61.7	128.0	113.6	105.4	100.1	ext.?	73.2%	68.7%	128.0	113.6
Euxenura[2]	267.3	239.5	8.33	8.36	9.56	9.25	3.67	3.64	56.7	55.5	133.2	125.7	120.0	116.8	ext.	75.3%	71.3	125.7	133.2
Cic. cic 2	230.2	218.8	7.98	7.67	8.73	8.23	3.33	3.44	53.5	51.3	159.1	131.2	127.2	116.7	ext.	76.9	70.3	159.1	131.1
Fossil 9	319.7	275.9	8.06 7.62	7.24	8.83 8.29	7.96	3.97	3.54 3.25	58.0	52.8	147.8	131.1	131.2	118.1	ext	82.6	71.8	147.8	131.1

3420
288.3
53.7

Recent Stark Taxa (2) prox. radii

	a length	b br prox art. facets	c br prox end at broadest part. cavity	d length lig. facet	e br lig. facet	f depth prox. end (facets)	ba	db	x	y	×7	dd	×6	fb ✓	Dist. from tub. coryla. facets edge of hyps tuberos (greatest)	h br hyp tub (greatest) ✓	ib	ii	yb
Jalubie																			
343462L	341.5																		
343462R	(342.0)	24.5	26.5	8.6	6.7	14.7	71.3	35.1	7.0	9.3	75.2	78.2	(27.6)	60.0	6.9	15.7	51.0	(64.3)	(79.6)	37.9
343466 L	316.8																		
343466 R	320.0	24.7	25.9	7.8	7.0	14.8	77.7	30.1	6.4	8.8	72.7	89.7	25.9	58.9	6.4	15.3	51.7	62.0	83.7	35.6
343464 L	310.3	23.3	25.4	6.8	6.4	13.7	75.1	(26.8)	6.2	8.3	74.7	(92.7)	26.6	58.7		14.6	57.1	62.6	(81.3)	35.6
R	312.0																		
343463 L	303.6																		
R	305.5	22.4	23.1	6.8	6.4	13.3	73.5	30.3	5.4	7.8	(69.3)	92.7	(24.1)	59.4	5.6	14.5	(57.6)	(61.7)	89.2	34.8
343467 L	303.6	23.8	25.4	8.3	6.3	14.1	78.6	34.9	6.0	7.1	(99.9)	76.0	25.2	(58.3)	6.0	15.1	54.6	63.5	86.2	31.3
R	305.0	23.4	25.3	8.3	6.4	14.0	76.7	(35.4)	5.8	7.3	79.1	77.0	24.6	59.7	5.5	14.9	54.7	63.7	86.0	31.2
343461 L	298.7																		
R	298.0	22.7	23.8	7.8	6.5	13.6	76.3	34.4	5.5	7.9	69.7	83.3	24.2	60.0	5.8	14.4	(50.4)	63.5	83.4	34.8
343465 L	290.0	22.3	24.1	7.9	5.9	13.2	78.0	35.2	5.6	7.4	74.7	(94.7)	25.1	(62.0)	6.6	14.2	51.9	63.7	88.2	33.2
R	(288.3)																		

8) 60 72 79
56
47
40
72

Eurypyge
14) 4335 3066
42
135
126
93
84
90

Fossil Stork Tarsi ~~McK.~~

McK. distend measurements		La Brea dist. meas.		Prov La Brea		Prov McK	
		23.08	II	20.1	I		
				21.6	III	21.4-9	III
	24.3	24.0	IIII III	22.6	IIII		
	25.1	25.8	IIII II	23.9	IIII I	22.0-8	IIII IIII
over 26.1	26.0-9	26.0-8	IIII IIII I	24.6	IIII	23.0-9	IIII IIII I
	27.5	27.0	IIII			24.0-5	III
	28.1						

aver 25.6

23.9 aver

aver 22.9

Taxonotaxus

	Jubiæ		Schabb.		Cic.		Ent.		La Brea											
br. hyptiannus shaped	heavy broad flared exprec. int. ridge	61-65% br. prox.	broad int. ridge sharply flared	61-65% br. max.	narrow	51-54% br. prox	narrow	55-57% br. prox	narrow	53-58% br. br. prox										
						slightly flared		at int. ridge		probably nearer Cic but some suggest Ent.										

fossil
circ
Eury
Jabiru

Tarsus

	Jabiru mycteria	Euxenura maguari	Ciconia alba	Ciconia maltha
Excavation proximo-axially	Depth of excavation too variable in all three species compared			
Proximo-plantar tuberosity	a prominent ball set off from surrounding art. surf. very definitely particularly externally where there is a narrow, deep, rounded cleft.	less clearly demarcated & no cleft externally. Largest	about same as Euxenura but ball smaller	Large - less clearly marked than Jabiru but tendency to cleft & no broader & shallower than Jabiru. Not as prominent as Jabiru
	14.0 - 15.8 mm across hypotarsus	10.9 - 12.4	8.9 - 9.3	11.8 - 13.8
proximity of hypotarsal ridges	internal higher than external posteriorly internally enter many often & left median more	enter same (not my specimens right)	same as Euxenura	same as Eury Cic.
nature of ridges	gradual slope & no marked ridges. Faint shallow depression prox. to hypotarsus proper	more abrupt slope, ridges more marked & depression above hypo. - may be	Definite ridges from typical. Depression present	Definite ridges & deep pit
connection of hypotarsus & bone		fairly deep & shallow		
length of outer hypotarsal ridge	14.0 - 17.4	~~14.2~~ - 16.6	11.5 - 13.7	16.2 - 19.8 mm
length inner hypo. ridge	13.9 - 16.9	13.0 - 14.7	10.1 - 11.4	13.7 - 17.8

Ciconia maltha

Type Carsus -

Shaft - more slender than Euxenura

head - less expanded " "

jaw - equal in width to Euxenura This less robust condyle

art. excav. dorsal part of shaft less abruptly overhung by head than Euxenura

inner profile of head - less oblique & beveled off " " " not constant

? upper part shaft - less deeply excavated " " " (shallow & shelf)

inner view, head - more compressed " "

" " hypoarsus - lower down " "

" " cranial ridge " more salient posteriorly " " " Ciconia

jaw near shaft flatter & less ridged post. than Euxenura, projects into head more

? outer profile of this area ↑ more concave " " " Ciconia

intermylohyoid tubercle more prominent than Euxenura because surface

drops more abruptly from jaw " " not constant

Transverse crest across hypoarsus ridge slopes from within outward, highest near edge

unlike Euxenura but like Ciconia

? outer view, head less "canted" forward " shaft than Euxenura, like Ciconia

" " backward slope for tubercle deeper " " " than Euxenura

? postero-lateral oblique surf. for attach. of art. liga. more sharply defined than Euxenura

oblique muscular ridge here is absent (present in Eux. & Cic.)

end view, margins & art. facets more clear cut } like Cic. not Eux.

? space bet. these post. margins greater ?

? depression bet. art. portion & hypoarsus a deep pit marked posteriorly by ridge

calcaneal ridges project straight back - as in Cic (Euxenura slopes inward

toward outer side into outer ridge more prom.)

Names as per Peters

Recent Storks

skin measurements from British catalogue (inches)

	skins								skeletons		
	Tarsus inches		Culmen inches		Tarsus millimetres	Culmen millimetres	culmen tarsus longest	Tarsus	Culmen	
	♂	♀	♀	♂						low mand.
Ouas Formus										
occitana	6.3	6.0	6.4	6.1	159.0	151.6	162.6	153.5	C slightly	Gengo: midgape to hind strongly curved up at end, culmen longer than tarsus
Anastomus	sex?		sex?							
lamelligerus	6.4	—	7.0	—	162.6	—	177.8	—	T	
Sphenorhynchus	♂	♀	♂	♀						
abdimii	4.8	4.7	4.4	4.2	121.5	118.0	112.0	105.5	T	
Dissoura	♂	♀	♂	♀						
episcopus	7.0	6.5	6.2	5.7	177.2	164.6	156.0	143.6	C	
Ciconia	♀	♂	♂	♀						culmen shorter than tarsus, no gape, short
ciconia	9.0	8.8	8.3	8.1	229.7	223.0	210.3	204.3	T	218 230	175-190 or 212-214 lamarckii
C. ciconia	♂	♀	♂	♀						
Boyciana	11.0	smaller	9.5	smaller	278.2	—	240.7		T	
Ciconia	♂	♀	♂	♀						
nigra	8.2	7.6	7.7	7.0	207.5	191.3	194.0	177.2	T	172-178 or 203-214
Euxenura	sex?	sex?	sex?	sex?						
galatea	9.6	9.1	8.3	8.2	242.0	229.2	210.1	207.1	T	230 267
Xenorhynchus.	♂	♀	♂	♀						culmen & tarsus equal, both very strongly up curved at end
asiaticus	12.0	11.0	12.0	11.5	304.0	278.2	304.0	291.2	C or equal	
Ephippiorhynchus	♀		♀							
senegalensis	15.0	—	12.6	—	380.5	—	320.0	—	T	257-289 or 302-323 lamarckii
Jabiru	sex?		sex?							
mycteria	12	—	12.5	—	304.0	—	316.8	—	C	288 342
Leptoptilos	sex?		sex?							
dubius	13	—	12	—	329.5	—	304.0	—	C	
L.	sex?		sex?							
crumeniferus	11.0	—	10.8	—	278.2	—	273.5	—	T	262 282 lamarckii 210 or 260 bill enormous
L. javanicus	♀ 9.8	♂ 9.0	♀ 10.5	♂ 10.3	248.5	227.8	265.9	261.1	C	
Total					276	320	281?			276 320 ~~350?~~ 260 or 338

Palaeophoyornithidae

Hla. Bones measured

	tarsus distal br dist	br mid trochl.	tarsus prox. br prox art.	br calc. ridges	length sustentac. calc ridge	br sh mid
tarsi						
V 4724 prox.			23.3	13.3	19.3	10.5
12098 dist	26.1	9.4				
comp. meas.	23.8	8.3	20.1	11.5	15.0	8.3
on La Brea	26.2	9.6 9.1	24.4	14.1	19.2	10.4
comp. meas.						
Jabiru						
12200 dist	—	10.0				

Tibiae	br ant.	depth	Coracoid	br facies for head	depth facet	diag. ht. facet
				23.4	12.7	17.8
12200	19.7	25.0		23.7	13.7	17.6
12200	20.1	25.2		20.5	12.6	16.7
11684 dale	19.0?	25.0				
comp. meas	17.2			19.8		
La Brea	20.9			22.3		
	18.2			20.2		
Jabiru	22.2			21.7		
V 2800				21.0?	12.5	16.7

Ulnae	depth trochl.	br dist
crane?		
12200	20.5	19.1
V 2801	20.8	19.3

Scap	br.
12200	26.7
12200	27.3

Tarsus cont'd		length intercdl. ridge	Br prox art	br right 10.5 least Br. (ext. ridge to flexure)
Cuban		18.2	24.3	17.0 estimated across ridge

Tibiotarsus Cuban	br dist	depth
	20.8	26.3

carpus	length bone outside	length intermeta. space	depth prox. outer side	depth dist end	Br sh.	depth sh.
V 4577 comp	144.4	84.6	30.8	16.4	11.4	6.7
V 2798 "	151.5	92.3	32.0	17.4	11.6	7.3
V 2795 "	—	91.1	—	17.3	11.5	7.3
12200 prox	—	—	31.8	—		
12200 dist				17.5	11.9	7.8
12200 dist				17.2	11.2	6.9
12102 dist				16.7	11.3	16.6
	129.5	80.1	26.4			
La Brea	150.0	91.3	30.7			
	129.3	95.6	28.8			
Jabiru	143.3	86.9	31.2			

old copy ①

	coracoid		humerus		carpus	carpus intin.		tarsus	tibia	tibia br. dist		Mand.	cran / br	up Mand culmen length estimate	
		99.3					79.1	309.9	363.6		19.6				296.3
fabirm	94.1	103.6	252.8	276.3	129.3	136.9	75.9	86.9	290 342	347.8	394.7	18.2	22.2	345.0 364.0	46.4	51.3	281.2 321.7
Ciconia	69.4	76.6	195.0	216.2	106 113.4	116.3	61.3 68.6	69.6	20?. 218.8 230.2	255.3	258.9	14.3	15.6	206 216	31.6	32.7	170 175 180
Eux,	79.9	87.6	212.2	225.4	113.0	120.8	65.3	69.4	239.5 267.3	273.2	309.8	16.8	18.8	247.8 287.0	34.8	37.6	211.8 244.7
Fratil LB	87.3	99.6	250.2	280?	129.5	150?	80.1 85.0	91.3	291.6 275.4 319.7	316.2?	372?	17.2	19.0 21.7	317? 316.2 349? 355.4	35.0	40.0	280 267.7 288.5
" Ha		82.8		291.0	144.5	151.5	84.2	92.2				18.5	19.0 19.4				

Ratio of size of various elements of the fossil to the same elements in the 3 compared living species.

	88.9%	S		=		L	L but overlap		Small but over lap		S		S		=		S		S but overlap	
Jabiru	92.7%	96.1%	99.0	101.0	100.0	110.0	105.4	105.0	95.2	93.3	91.2	94.4	94.6	97.7	100.2	97.6	77.2	78.0	95.0	90.0
	119.1																		very	
Cic	124.8	130.0	128.3	129.3	114.2	129.0	116.7	131	126.0	138.2	124.1	124.2	120.2	139.0	146.2	168.0	110.8	118.8	159	160
	109.7	L but overlap											L but overlap slightly				ap.	= (L)		
Eux	109.1	113.4	117.9	124.3	114.3	124.2	122.8	131.3	120.2	119.2	115.9	120.7	102.3	115.2	128.0	123.8	100.5	106.2	126	122
	mins.	maxs.	mins.	maxs.	mins.	maxs.	mins.	maxs.	mins.	maxs.	mins.	maxs	mins.	maxs.	mins	maxs	mins	maxs		

Ratio of size of Ciconia : Jabiru : Eux.

(84.0)	87.4	(92.0	95.5	(93.7	96.3	(94.3	100.1	(85.6	86.9	93.5	83.7			83.3	75.0			88.5	93.7

Old copy (2) Lengths of stork bones compared

	Ja Area	Ha.	Jafur	Eur	Cic		Ratio max Eur to max fossil	Ratio max Jaf to max fossil			Ratio max Cic to max fossil	Ratio min Eur to min fossil		Ratio min Cic to min fossil		
Coracoid	82.4 mx Ja Area		94.1	79.9	69.4	1	−13.5%	+3.8%	3	4	24.4%	96.9	1	84.3	3	
	101.2		105.0	87.6	76.6		86.5	103.8			75.6					
Scapula	23.7		24.0	19.5	17.8	2	−14.7%	=	1	2	12.4%	83.2	5	75.1	5	
	26.4	27.0	27.0	22.5	20.5		85.3	100.0			77.6					
Humerus	250.2		252.8	212.2	195.0	6	−19.6%	−1.1%	2	3	12.6%	84.7	4	77.8	4	
	280.0?	291.0	276.3	225.4	216.2		80.4	98.9			77.4					
Ulna																
Carpus	129.5		129.3	113.0	113.4	5	−19.4%	−5.4%	4	1	12.4%	87.4	3	87.6	1	
	150.0	151.5	143.3 +	120.8	116.3		80.6	94.6			77.4					
Femur																
Tibia	316.2															
	355		347.8	273.2	255.3	4	−16.8%	+6%	5	6	30.4%	76.3	6	71.2	6	
	372?		394.7	309.8	258.9		83.2	106.0			69.6					
Tarsus	259.6		290.0	239.5	218.8	3	−16.3%	+7%	6	5	27.8%	91.6	2	84.3	2	
	319.7		342.0	267.8	230.2		83.7	107.0			72.2					
							86.5	107.0								
							80.6	98.9								
							5.9	8.1								

Humerus & carpus mx Scap mins. larger than Eur, min. smaller
Tarsus mx Eur, min Eur.

Free

Fs Js Fs J J

342
288
5'4

Jabiru mycteria	Length of Humeri	Length of Radii	Length of Ulnae	Length of Coracoids	Length of Carpo-metacarpi (ant.)	Length of Sternum	Depth of Sternum	Length of Femora	Length of Tibiotarsi	Length of Tarso-metatarsi	Length of Pelvis	Width of Pelvis	Length of Mandible	Length of Cranium & beak	Naked length of tarsus			
343462	276	344	357	124	144 (193.5)	151	77	131	395	345 (342)	145	90	364	397	41.8	34346 2	341.5'	L (7)
																	342	R
343466	269	344	330	121	136 (137.8)	120	87	129	369	320	142	89	344	373	43.2	343466	316.8	L (6)
																	320	R
343463	262	335	322	114	133 (135.5)	132	78	121	355	303	136	77	320	358	44.7	343463	303.6	L (4)
																	305.5	R
343461	261	334	322	117	133 (135.5)	140	78	121	347	297 (298)	139	82	332	366	45.5'	343461	294.7	L (2)
																	298	R
343464	263	330	341	117	138 (138.9)	143	82	125	368	310	145	90	334	365	44.7	343464	312.0	R (5)
																	310.3	L
343465	252	305	318	108	128 (129.2)	133	82	124	349	287 (288)	137	81	316	346	44.8	343465	290.	L (1)
																	288.3	R
343467	260	323	354	114	136 (136.9)	140	82	125	363	305	136	83	328	358	44.8	343467	303.6	L (3)
																	305	R
Jabiru				97.9	129.3					216								
				103.6	143.3					309								
Euxenura 204	225.4			87.6	120.8				309.8	267			288	1080 (upper)	45.3			
Bi 242	213.8			79.9	113.2				283.5	239			248	92 (upper)	47.6			
19940	219.9				116.5				282.5	247			—		47.3			
49041	212.2				113.0				273.2	230			225		49.3			
Sic. cic. 203	209.2			75.1	113.4				256.3	218			218		52.2			
B 1334	216.7			74.4	116.3				258.9	230			217	65.2	50.6			
Bi 13.04	195.0			69.4					—	213								
Leptoptilos 34					154				344.3	262			302		58.8			
205					159				340.7	281			301		56.4			
Jabiru	250			87.3	129.5				316.2	273.5					47.5			
	260			101.3	150				372.8	319.1					47.0			
				82.8	144.5				—	290?					49.7			
Mycteria	291?				151.4					322?					47.6			

	Tarsus	Culmen	ant. 1st toe
Leptoptilos crumeniferus			
17399	289	304	350
17400 ♂	~~239~~	~~193~~	~~219~~
Ciconia ciconia	213	190	212
17401	218	203	219
18924	193	165	197
17402	196.5	168.5	201
Leptoptilos javanicus ♂ 18434	229	254	293

Ratios of lengths of bones (Storks)

	Humerus to tarsus: min to min	Humerus to tarsus: max to max	carpus to tarsus: min to min	carpus to tarsus: max to max	coracoid to tarsus	tibia to tarsus
Jabiru	87.6	83.2	44.6	40.8	32.4	30.4
Eux.	88.8	84.4	47.3	45.3	33.3	32.8
cic.	89.2	94.2	51.8	50.6	31.7	33.2
LaBrea	91.6	87.6	47.0	47.0	30.0 31.6	31.2
Florida	~	~	—			

wing & leg lengths

Cic. Eux Jabiru Fossil

	203	1334	1507	207	242	49041	19540	3434 61	62	63	64	65	66	67	max	av	min
humerus	209.2	216.2	197.-	225.4	213.8	212.2	219.8	262.1	276.3	262.3	264.6	252.8	269.4	259.6	280.0	265.1	250.2
ulna		248-	231-	264	276.5	243	255	322.0	357.0	322.0	354.0	318.0	341.0	330.0	345.0	320.0	300.2
carpus	113.4	116.3	106.0	120.8	113.2	113.0	116.5	135.5	143.3	135.8	138.9	129.3	132.8	136.9	151.5	140.9	129.5
Total		597.3	534.0	610.2	573.5	568.2	591.4	719.6	776.6	719.8	757.5	700.1	748.2	726.5	776.5	726.0	679.7
hum + carp.	322.6	332.5	303.0	346.2	327.0	325.2	336.4	397.6	419.6	397.8	403.5	382.1	407.2	396.5	431.5	406.9	379.7
femur		94.0	85.3	108.8	100.7	none	105.5	111.8	121.6	114.7	118.5	114.2	120.2	116.1	122.7	115.0	107.6
tibia	255.3	258.9	239.5	309.8	283.5	273.2	282.5	349.2	394.7	354.6	368.5	347.8	370.0	360.5	372.0	345.4	316.2
tarsus	218.8	230.6	205.0	267.3	234.5	229.4	246.6	298.7	342.0	305.5	310.3	290.0	320.0	303.6	319.7	295.5	273.5
Total		582.9	529.8	685.9	623.7	599.6	634.6	759.7	858.3	774.8	797.3	752.0	810.2	780.2	814.4	755.9	694.3
fem + tarsus		324.0	290.3	376.1	340.2	329.4	352.1	410.5	463.6	419.2	428.8	404.2	440.2	419.7	442.4	410.5	378.1
Ratio wing by		99.3	100.8	89.6	92.0	95.3	93.3	94.3	90.2	94.8	94.8	93.3	92.4	93.2	95.3	94.2	92.8
Ratio wing by short leg		102.3	104.3	92.1	96.2	98.3	94.9	96.8	90.7	95.4	93.8	94.5	92.6	94.5	97.7	99.0	102.8
coracoid	75.1	76.4	68.8	87.6	79.9			100.1	105.0	97.9	100.7	94.1	103.6	103.6	101.2	93.0	82.4
Ratio coracoid to wing		2.5	2.2	2.5	2.4			2.5	2.50	2.46	2.5	2.46	2.52		2.3	2.24	2.1
" to sh. leg		2.3	2.3	2.4	2.3			2.46	2.27	2.36	2.34	2.32	2.34		2.29	2.26	2.1

fossil wing & leg nearer in size Diam Jab.;
either wing longer or leg shorter in fossil
rel. to coracoid both are longer than wing curve xo.

averages confused

Set Femur = 0

	min fossil vs Eux. max	max fossil vs Eux max	min fossil vs cic max	max fossil vs cic max	min for max cic	max fossil Tic
Coracoid	−6.2	+13.5	+7.0	+24.3		
Humerus	+10.1	+19.5	+14.6	+22.7		
Carpus	+6.7	+20.3	+10.3	+23.0	Total excluding beak	Total excluding beak
Tibia	+2.3	+16.6	+18.1	+30.2	128.1	
Tarsus	+3.1	+16.8	+23.6	+27.9	73.6	
manid	+10.1	+17.7	+32.3	+38.0		
culmen	+8.1	+15.3	+38.6	+37.7		
	40.4 − 6.2	119.7	144.5	206.8		
	7) 34.2	7) 119.7	7) 144.5	7) 206.8	5) 73.6	5) 128.1
	4.9	17.1	20.6	29.5	14.7	25.6
Set equal.						
coracoid	−1.3	−3.6	−13.6	−5.2	−7.7	−1.3
humerus	+5.2	+2.4	−6.0	−6.8	−.1	−2.9
carpus	+1.8	+3.2	−10.3	−6.5	+4.4	−2.6
tibia	−2.6	−.5	−2.5	+.7	+3.4	+4.6
tarsus	−1.8	−.3	+3.0	−1.6	+8.9	+2.3
manid.	+5.2	+1.6	+12.3	+8.5		
culmen	+3.2	−1.8	+18.0	+8.2		
Femur						
Ulna						

	fossil vs Eux. Eux	fossil vs cic Cic	fossil vs jab. Jab	Eux vs cic	Jab vs Eux	Jab vs cic	Jab vs jab	Eux vs cic
	+14%	+28%	−7.4%	+11.2	−6.5	−8	−2.8	−1.8
	+22%	+24%	+0.5%	+6.1	+1.5	−7	+5.1	−6.8
	+21.5%	+27%	+3%	+4.1	+1.0	−9	+7.6	−8.9
	+19.3	+37.5	−5.0	+16.1	−1.2	+1.5	−0.4	+3.0
	+20.5	+36%	−4.6%	+13.0	—	—	—	—
	+29.5	+57.8%	+6%	+22.5	+9.0	+21.8	+10.6	+9.5
Femur	+11.5	+30.8	−1.7	+17.8	−9.0	−5.8	+2.9	+4.8
Sum	+17.4							

Set coracoid = 0

	=	=	=	=
	+8.8%	+1%	+7.9	−5.1
	+7.5%	−1%	+10.4	−7.1
	+5.3	+9.5	+2.4	+5.2
	+6.5	+8%	+2.8	+2.2
	+15.5	+29.8	+13.4	+22.3
	−2.5	+2.8	+5.7	+6.6

Sum +3.4

Ratios 2/3 2/3 2/3

Jaketcopy = (3)
11/15/40

Means of U.S.N.M. skel. Lengths stock bones compared

	Measlha Sup	Jab.	Eux	Cic	Ratio max Eux to min fossil	Ratio max cic to min fossil	Ratio max cic to min Eux.	Ratio max fossil to min Jab.	Ratio max fossil max Jabirm	Ratio min fossil min Jab.	Ratio min Eux max Cic	Ratio max. Eux to max fossil	Eux vs cic av.	Ratio min. Eux min fossil	max cic max fos.	fossil vs Eux av.	fos vs cic av	fos vs jab. av.
Coracoid	82.4	94.1	75.5? 79.9	(4) 69.4	L 106.2	7.0 93.0	S 96.0	Xs' 107.5%	3.65 96.4	12.5, S+r 87.5	7.2 109.2	86.5	111.2	min minimum	75.7	114%	128%	92.6
av.	93.0 S	100.7	81.2%?	72.8														
	101.2	105.0	87.6	76.6														
Humerus	250.2	252.8	(4) 212.2	(4) 195.0														
av.	265.1 ✓	263.8	217.6	204.3	89.9	14.6 86.4	L 101.7	10.8 110.8	= 101.1	= 99.3	15.7 115.7	80.4	106.1	84.7	77.3	122%	129.5%	100.5%
	280.0	276.3	225.1	216.2														
Carpus	129.5	129.3	(4) 113.0	(3) min 105.5														
av.	140.9 ✓	136.7	115.8	111.0ap.	93.3	10.3 89.7	L+ 103.1	17.1 117.1	L 105.7	= 100.0	11.2 111.2	79.7	104.1	87.4	77.0	121.5%	127.9%	103%
	151.5	143.3	120.8	116.3														
Tibia	316.2	347.8	(4) 273.2	(3) min 239.2														
av.	345.4 S	363.6	288.1	249.4p	S 97.7	18.1 81.9	S 94.7	?.? 109.8	S 94.3	91.2 S+	22.1 122.1	73.4	116	86.4	69.8	119.3	137.5	95.0
	372	394.7	309.8	258.9														
type wanted	259.6																	
Tarsus	275.5	290.0	(4) 229.4	(3) min 205.0														
292 av.	295.8 S	309.9	245.7	217.4p.	S 96.9	23.6 76.4	= 100.3	10.0 110.0	S+ 93.4	S 95.1	19.7 119.7	83.2	113	83.3	72.1	120.5%	136%	95.4%
	319.7	342.0	267.8	230.2														
maud.	319?	315.1	(4) min 248.0	(3) min 207.1														
av.	335.3	333.9	258.6ap.	211.5ap.	S+ 89.9	32.3 67.7	S+ 87.2	10.7 110.7	2S 96.0	= 101.1	47.5 147.5	82.3	122.5	min. 77.8	62.0	129.5%	157.8%	100.6%
	348.5	363.6	286.6	216.0														
calculated from mandible			(42 min	(2 min														
cubnens	267.7?	281.2	211.8	170.0	S+ 91.9	38.6 61.4	S+ 85.0	2.8? 102.8	S+r 89.7?	S 94.9	48.3 148.3	84.7		min 79.2	62.3	—	—	
av.	288.5 scale from mandible	296.3	220.6%	175.4p.														
		321.7	244.1	180.0														
avail. spec. molar 279 to 324 mm. depending on how first 2 are measured																		
Stemm																117.4	134.7	
Eixeim	204 L, 490 41 S (242 close to S)																	
Cic	1334 L, 1304 S (1504 close to S)																	
Femur	104.6	111.8	97? 100.7	84.6									117.8			111.5	130.8	98.7
	115.0 S	116.7	103?	88.?														
	122.7	121.6	108.8	94.0														
Ulna	318 338 mm ✓	318	243	231														
	not min.	338 357	3-3.0 264															

Chars. of Stock compared

42 chars.

	Cic.	Bet.	Eux	Neither
Cran.				
1	✓		✓	
2	✓		—	
3	✓		—	
4	✓		✓	
5				✓
Up. Maxil.				
1	✓		—	
2				✓
3	✓		—	
3a	—		✓	
proportions				✓
Low maxil.				
1	✓		✓	
Jugular	✓		✓	
Sternum				
1	✓		—	
2	✓		—	
3	✓		—	
Coracoid				
1				✓
2	✓		✓	
3	✓		✓	
4	✓		✓	
Scap.				
1	✓		✓	
2	✓		—	

	Cic	Bet	Eux	Neith.
Humerus				
1	✓		—	
2	✓		✓	
3	✓		—	
4	✓		—	
5	✓		—	
Ulna				
1	✓		✓	
2	✓		✓	
carpus				
1				✓
2	✓		✓	
3	✓		✓	
4	✓		✓	
5	✓		✓	
femur				
1	✓		✓	
2	✓		—	
3	✓		✓	
Tibia				
1				✓
2	✓		✓	
3				
Tarsus				
1	✓		—	
2	✓		✓	
3	✓		✓	
4	[illegible]			✓
5				✓

Fossil comp. & Ext & Cic.

	Neither	Ciconia	intermediate	Extensa	Neither
Coracoid head	✓	They differ too			✓
Brach. tub		✓		✓	
st. cr. dep		✓		✓	
tr. facet		✓		✓	
Scaps ①		✓		✓	
②		✓		—	
Humms rel. epicondyle		✓		✓	
lig. attach		✓		—	
deltoid	✓	They are nearly alike			
brach. cent.		✓		—	
Ulna ①		✓		✓	
②		✓		✓	
Carpus short MI	✓	They are alike			✓
①		✓		✓	
(2)		✓		✓	
(3)		✓		✓	
4		✓		✓	
femur trochin.		✓		—	
		✓		✓	

	Neither	Cic	Ref.	Ext	neither
Tibia lig. attach	✓	They differ			✓
cnemial crest		✓		✓	
Tarso supers. ①		✓		✓	
②		✓ alike		✓	✓
③		✓		✓	
④		✓		✓	
⑤		✓ alike			✓
extens. supracond.		✓		—	
parietal		✓		—	
sup. oc		✓		✓	
midg		✓ differ			✓
hit.		✓		—	
up. marg ①			✓		
②		✓		—	
③					✓
④			✓		
Con. cond.			✓		
symph.		✓		—	

differ from both IIII IIII
like Ciconia III III
Ref. III

Tarsus bones of tarsus
Sig. characters

d. cora. ? Z (9 / 11 mid) / from Semnole
Scaps (2 " " " " "
humerus 1 Vero ?
carpus 2 Vero (mid ?)

The ~~particular~~ characters in which ~~maltha~~ Ciconia & Euxenura differ & in which maltha agrees with the former, are:

① Position of the protuberances on the basi temporal plate

② The symphysis of the mandible is only 30% of the length of the jaw.

The chars. in which maltha is distinct from the other storks — presumably specific chars, are:

① The inferior border of the supraoccipital is raised into a definite & prominent ridge

② In the carpometacarpus M.1 is high & short,

③ Long narrow skull & beak

In the matter of size C. maltha is ~~about~~ from 25 to 35% larger than C. alba. Compared with Jabiru the leg bones are slightly shorter while the carpus is larger & the humerus about equal. The mandible is as long as in Jabiru — but the skull is one 20th narrower.

11.1

7 7 8 7 7/36

Generic characters — Storks

(1)

Breadth & length of hypotrausius

Breadth of hypotrausius 90% or more of length of longest distinct surface of calcaneal ridges.

Jabiru

Breadth of hypotrausius less than 80% of length of calc. ridge

Cic. Eux. & fossil

Breadth of hypotrausius to br. prox. end

61½-65% — Jabiru

52-60% — fossil

51-54% = Ciconia

55-57% = Euxenura

Area between hypotrausius with respect to and articular head

gradually sloping down to hypo. area gives sense of fullness & heaviness with very little depression immediately prox to hypo. What there is is longitudinal

Jabiru

More abrupt descent to hypo with deep depression or pit ant. to hypo at its prox. end, clearly bordered by at least internal border fairly thin & sharp.

fossil

Intermed. No. near found are Eux & Cic

(3)

Tuberosity

High, narrow & pointed (pointing forward) - Jabiru
& indent on ext. side

Large, but flattened at tip & no indent - fossil

About same as fossil is Euxenura
Ciconia (rather smaller) & pointed a bit, distally

Distal end -

Ligamental attachment

Relatively longer & more slender in fossil than Other quite well excavated around & so quite prominent also

Ext side Inferior border of shaft continuous with a line ~~ru~~ diagonally across ext. surface of tarsus almost to ant. edge.

Deviation antly more abrupt (at an ∠ in fossil than Rec) & longer more gradual posteriorly in fabrin, T (D. Minck) Euxenura) Cicornia a bit more similar to fossil less marked

58.0 - 69.4 fabrin
48.5 - 55.5 fossil
38.3 - 48.0 Cic.
46.8 - 49.2 Eux.

Ant. side of shaft - post. border in region of hypotarsus ~~set off from~~ by a definite excavation ~~of hypotarsus~~ sharply demarcated ~~sharply bordered by~~ the raised post. Border fabrin

~~The rounded hypotarsus~~ ~~one~~

~~Less clearly marked & rounded~~

~~slightly depressed in~~ same fossil

Depression rather evident but, like ~~not~~ demarcation Fabrin clear ~~not~~ the sharp ridge it is in fabrin

Euxenura some fossil

~~slightly~~ more excavation

very marked - Cicornia. = some fossil

Neither ?

Martha - clears distinct from all others

cranium

Inferior Border of supraoccipital raised into ridge

carpus

High short metacarpal 1

La Brea Stroke

Sternum	6
Scapula	13
coracoid	33
furcula	17
pelvis scom	4
humerus	19
ulna	36
carpometa.	14
femur	35
tibiotarsus	54
tarsometa.	63
Lower mandible	4
Cranium	7
beaks	1
	308

Hon? Lambrecht?

The Phylogenetic History of the Storks

If we place together in tabular form the distribution in time and in space of the fossil forms as well as the recent storks we come to certain conclusions which correspond to the results of mammalian paleontology

The excavations in the Fayum have already confirmed Osborn's hypothesis that Africa was the radiation center therefore the place of origin of a number of mammals. So it already appears to be assured that the stem of the Proboscidia, Sirenia & Hyracoidea developed in Africa & from this centrally situated part of the world conquered the other continents.

The table on p. 330 appears to indicate that at least one bird stem, the stem of the storks (Ciconiiformes) also originated in Africa. In this regard the fact that Africa even today is the home land of the storks is also important. Here are included the genera Ciconia, Leptoptilus, Ephippiorhynchus, Balaeniceps, Pseudo-tantalus, Abdimia & Anastomus. Here in the Quatrani-Stufe assigned to the lower Oligocene appears the so far oldest known stork, Paleoephippiorhynchus.

From here spread out the genera Leptoptilus, Amphipelargus, and Tantalus - all three giant storks - to Europe, Leptoptelus also to Asia, as well as Xenorhynchopsis, (likewise counted as a giant stork) to Australia, Palaeociconia to So. America.

Naturally the small forms of Europe (Propelargus, Pelargodes) & Australia (Palaeopelargus) were not considered as degenerate descendants of the giant storks, on the contrary: purely theoretically — following the Gangry-Deperet law of the [illegible] historical appearance — the small forms were the oldest of the giant storks, which began with Paleoephippiorhynchus & led up to the fossil & recent genus Leptoptilus as well as to Pseudotantalus, Balaeniceps & Mycteria, are the end of the line of the Storks trunk. But that also the other Ciconiiformes in Africa developed & from there spread to the other continents appears in consequence of the central situation of this part of the earth

even in such remarkable forms. ~~This paper~~ The geographical distribution of the recent storks, a fortunate find in the feature of the paleobiological classification of bird orders can however ~~even~~ solve even this riddle.

Einar Lönnberg we thank for two treatises, rich contents, on the the genus & origin of the No. Amer. birds & the Asian fauna. In his first work he showed us which forms ~~these~~ are endemic, which more widely distributed & which migrated from the palearctic into, neotropical region of N. Amer. unfortunately Lönnberg did not extend his studies on the in discussing the stork forms also in tropical America, this he remarked ~~on the~~ caused the following "the cranes have undoubtedly their center of gravidity on the eastern hemisphere & the Palearctic region is most rich in forms with the 9 species, whereas Asia has 5 (including Baleanica) the Oriental region 2 & Australia 1, & the 3 spec. found in N. amer." Accordingly here lies a parallel to the here described radiation of the storks.

In his second study Lönnberg sketched the development & distribution of the Asian fauna. This very "draughty" paleo-zoogeographic synthesis must be corrected however in view of Paleornithology. Lönnberg accepted namely in reviewing the constant with present, palerzology in the Pliocene an annual migration out of Asia to Europe & Africa. & in line with this made the following statement:

"Of this new fauna consisted, however, not only of mammals but also of birds & reptiles etc., which, although they now like the steppe mammals are regarded as typical Asians, in reality originated from Africa."

"A very striking example of such birds is given by the ostriches which now have a wide distribution over the dry parts of Africa & outside this continent only rare found in the Arabian - Syrian desert. In Mongolia have however, been

found eggs of a big ostrich, named Struthiolithus, & Prof. Carl Wiman has informed me, that he, among other points from Mongolia, also has received the pelves of the same type as Struthio [struthio wimani Lowe]. It is clear that the African ostriches have come from Asia, & not opposite because before the diluvial had killed the fauna there was no place for any ostriches on the Ethiopian continent. The herds of the Steppe mammals were also followed by the vultures, which fed on the remains of the "kills" of the big carnivora. The same may be said about the Marabou, Leptoptilus. Many kinds of prey peoples to hunt, or hunt exclusively on open land like — some falcons, as these still have relatives in Asia, it is therefore probable that they also belong to the new fauna etc." Lönnberg 1929 p. 16.

The above citation is from the work of Lönnberg published by the Swedish Akademie der Wissenschaften June 5, 1929. Opposed to this I might point out that in my study published Feb. 4, 1929 by the Bayerischen Akademie der Wissenschaften & cited as hypothesis of Lowes (Studies & Observations bearing on the phylogeny of the ostrich & its allies Proc Soc Zool. Lond. 1928) in which he puts forth the opinion that Struthio probably actually only to this day the Pikermi Samotherium-fauna only arrived out of Asia into Africa, however, even before this & many kinds must have existed which the Aepyornithes (delweied) & in which I came to the following conclusion.

German. "I am strongly convinced that Struthio represents a form which Lowe in his cited hypothesis has supposed & which (in the present state of our paleontological knowledge) the Aepyornithes of Madagascar (fide?) before the Struthiones (came) to Africa out of Eurasia". "

This, my conviction I rendered fact however ~~indicates~~ by no means contradicts Lowenberg's statement that "the Apican continent was originally during the early Tertiary, including Nubien, covered by a vast evergreen forest in consequence of a prevailing moist climate." Then these "ratites" which we have learned to known in Eremopezus & in Struthio must in no case have been birds of the steppes but could have been even birds of the forest, as the modern cassuary. Certainly they have arisen from a steppe or desert environment not in a wooded terration & in the older Tertiary have secondarily passed over to the forest life. In this case the descendants of Struthio, that is the Aepyornithes, again return to the steppe life.

What, however, concerns the example of the Marabou cited by Lowenberg, so indicates the existence of a giant stork in the lower Eocen of the Fayum (Palaeoephippiorhynchus) against the Lowenberg interpretation. That Leptoptilus is found in the Siwalik-Fauna - therefore in the Pliocen - still does not prove that the Apican Marabous have migrated out of India to Apica, especially Leptoptilus falconeri was significantly larger than Leptoptilus ayala, following therefore the branch of the Marabou stem. However that Palaeoephippiorhynchus is found in the lower Oligocen of the Fayum appears to indicate that the giant storks had their radiation center in apica & from this place of origin have spread to the other continents.

Miller, L.H.

1910 Wading birds from the quaternary asphalt beds of Rancho La Brea. Univ. Calif. Publ. Geol., vol. 5, pp. 439-448.)p. 439-446)fig.1-7)

1912 Contributions to avian paleontology from the Pacific coast of North America. Univ. Calif. Publ. Bull. Dept. Geol., vol. 7, p. 78.

1922 Fossil birds from the Pleistocene of McKittrick, California. Condor, vol. 24, pp. xxxxxxx p. 123.

1925 Avifauna of the McKittrick/ Pleistocene. Univ. Calif. Publ. Bull. Dept. Geo. Sci., vol. 15, pp. 307-326,(3 figs. in text) (p.317)

1925 The birds of Rancho La Brea. Carn. Inst. Wash. Pub. no. 349, pp. 63-106, 6 pls., 20 figs. in text. (pp. 73-75, fig. 1-5)

1931. Pleistocene birds from the Carpinteria asphalt of California. Univ. Calif. Publ. Bull. Dept. Geol. Scis., vol. 20, pp. 361-374, 4 figs. in text. (p. 366)

1932 The Pleistocene storks of California. Condor, vol. 34, pp. 212-216, fig. 23.

1935 A second avifauna from the McKittrick Pleistocene. Condor, vol. 37 pp. 72-79 (p.75)

1938 A study of the skull of the Pleistocene stork, Ciconia maltha, Miller. Trans. San Diego Socl Nat. Hist., vol. 8, pp 455-462, pl. 37.

Sellards, E. H.

1916 Human remains xxxxxxxxxxxxxxxxxxxxxx and associated fossils from the Pleistocene of Florida. Fla. Geol. Surv., 8th Ann. Rep, pp. 121 160, pls. 15-31 (pp. 146-147, pl. 26, figs. 1-4 and text fig. 15c)

Wetmore, A.

1928 Bones of birds from the Ciego Montero deposit of Cuba. Amer. Mus. Nov., no. 301, pp. 1-5, figs. 1-2 (pp.2-3)

1931 xxxxxxxxxxxxxxxxxxxx

Sharpe, R. Bowdler
1898 Cat. of Birds of Brit. Museum
Vol. 24 pp. 291-320

R. Max Dunn Sec. Sigma Xi Chem.
May 27 6:15 Kirchhoff Hall
Psych. Lect. 10000a

247
201)5'5'x3
4 14
1890
12 42
1460

Stork

Tarsus of Fossil

mean 18 mm. smaller than Jabiru (overlapping)
45 " larger " Ciconia (no ")
9 " " " Euxenura (no ")

Coracoid

mean 6 mm. smaller than Jabiru (overlapping)
11 mm. larger than Ciconia (no overlap)
min. = max. of Euxenura

Humerus

min. 2 mm smaller than min Jabiru } about equal
max. 4 " larger " max " "
min 3 4 mm " " max Ciconia (no overlap)
min 2 5 mm " " " Eux. (" ")

Carpus

min. = min Jabiru
max. 8 to 10 mm larger than max Jabiru } equal or larger
min 16 mm larger than max Ciconia (no overlap)
min. 9. mm " " " Eux. (" "

Tibia

min. 31 mm. smaller than min Jabiru (overlap)
max 22 " " " max " (")
min. 54 " larger " min. Cic (no overlap)
" 7 " " " " Eux " "

Coracoid

min. 12 mm smaller than Jabiru } overlap
max. 4 mm " " " "
min 6 " larger " Cic. (no overlap)
" 5 " smaller " Eux. (" ")

~~Cranium (width)~~ Mandible

min 1 mm. larger than jab. } equal
max 9 " smaller " "

? min 100 mm. larger " max Cic
" 29 " " " " Eux

Cranium br.

max. 5 mm. smaller than min Jabiru = no overlap
min. 3 mm larger " max Cic. " "
min. 2. mm. smaller " max Eux } nearly equal
" 0.2 mm larger " min " } Jabiru larger
max 3 mm smaller " max "

Difference in size % than (Jabiru) / Cic / Eux

	Jabiru	Cic	Eux
Coracoid	4-9% —	25 to 27 30% +	9 to 11 13% +
Humerus	=	28 to 24 29% +	17 to 20 24% +
Carpus	= to 10% +	14 to 22 29% +	14 to 19 24% +
carp. (extra)	5% +	16 to 32 [illegible]	23 to 32 [illegible]
Tarsus	5-7% —	26 to 32 38% + ✓	19-20% +
Tibia	6 to 9% —	24% +	15 to 17 20% +
Tibial br.	2 to 6% +	20 to 30 39% + ✓	2 to 9 15% +
Manus	=	46-55 64% +	23 to 28% +
Cran.	22 to 23% —	10-14 18% +	= to 6% +

Fossil Mandible proportionately longer than in Ciconia (equally Jabiru (in Eux))

Fossil Cranium more slender than Jabiru (proportionately to the elements but Humerus + carpus prop. longer than in Jabiru (equally it would the elements but not Tarsus rel. longer than Cic.

	C.	Sur	Sab	none
Campus n.				✓
· four chars	✓	✓	—	
Femur				
trochanter	✓	✓		
extent of crest	✓	—	✓	
uterus line	✓	✓	—	
Tibia				
lig. att.	closer than Sab.		—	✓
crenu crest with or above	✓	✓		
dist. lat. crest	✓	✓		
Tarsus				
hypo	near	near	—	
calc. ridges	✓	✓	—	
with cdr. tub.	✓	✓		
excav of "	—	—	✓	
nut. dist. tuch				✓

	Cic	Eux	Jab.	Nelb
Skull				
Brain case & supraorbital flare	↙	↙	—	
Naso-frontal area	close	slight	—	
Parietal narrowing	↙	—	—	
occiput sig	exact	close	—	
" border marks			—	↙
height to breadth cran.	close	—	overlaps	
upper mandible shape	↙	↙	—	
back of dorsal hump	↙	—		
border nares	—	close	?	↙
palatal groove extent & depth	closest	less	—	
" sagittal extent	—	closest		
height & br to length				↙
br to height	—	closest		
lower mandible shape	closest	next	=	
symp length				
furcula				
Sternum				
depth of keel	↙	↙	—	
acuteness of curve	↙	—		
pneumatic cavity	↙	—		
excav of carina	↙	less so	variable	
coracoid				
head				↙
brach. tub	↙	↙		
sten. cora imp	↙	↙		
br. facet	↙	↙		
general	↙	↙		
Scapula depression	↙	—		
Humerus papilla	↙	↙		
ectepi pneu.	↙	↙		
" sig	↙	—		↙
deltoid	↙	—		
bicip. crest	↙	—		

Previously described elements
† what they were compared with

				fig (prox. end)	compared with
Tarsus	1910	,	comp. type, frags of ends		Eux † Cic
Tibia	"		no complete	(figured)	n y
up. mandible	"		comp		" "
coracoid	"	1		(figured)	" "
furcula	"	1			" "

other class.

all Carp. specs in gen to C. maltha 1931 ——— ~~no comparisons~~

Tarsus	1932		Eux - Jab.
Tibia	"		" "
Femur	"		" "
humerus			
carpus			
cora.			
furcula			
mandible			

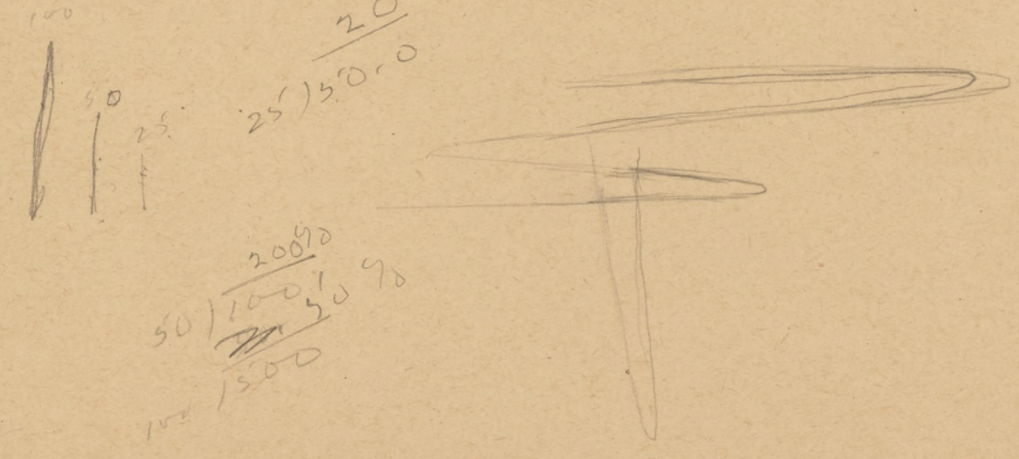
Dif. between aver as calculated with all X fix,
and only max, + near min -

with 3 (lacking min

coracoid	0.2	aver 72.5	72.7	73.6 dif. 9.	.8 adds .4
humerus	2.3	" 204.3 – 206.6		207.6 dif. 3	3.1 adds .8
carpus	?	" with max + min only	111.5	112.1	adds .6
tarsus			217.6	218.0	" .4
tibia		" "	249.0	251.0	" 2.0

dif. aver. calc. with all Fix + with front min
(just max + next min)
true max + min

cora		81.0	81.1 av. adds 0.1
hum	4.5	217.6 – 222.1	218.8 av. adds 1.2
carpus	1.2	115.8 – 117.0	
tarsus	7.7	245.7 – 253.4	248.3 av adds 3.4
Fibia	9.4	287.2 296.6	
manus	8.7	258.4? 267.3	
culmen	8.2	220.6? 228.2	



75.8
74.5
74.6
3)226.9
75.6

75.6
87.6
2)163.2
81.1

163.2
79.9
3)243.1
81.0